

A MONOGRAPH OF THE GENUS Clitoria (LEGUMINOSAE: GLYCINEAE)

By

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Abstract of Dissertation Presented to the Graduate Council  
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A MONOGRAPH OF THE GENUS Clitoria (LEGUMINOSAE: GLYCINEAE)

by

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This monographic treatment of the genus Clitoria L. (Leguminosae: Glycineae) is the first since that of George Bentham in 1858. The genus is treated on a world-wide basis. The study is based upon examination of approximately 7000 specimens from thirty-three lending institutions, and from field studies of United States species. Treated in synonymy are Clitorius Petiv. ex Dill., Clytoria Presl, Macrotrullion Klotsch ex Schomb., Martia Leandr. Scar., Martiusia Schult., Nauchea Desc., Neurocarpon Hamilton, Neurocarpum Desv., Neurocarpus Hassk., Rhombifolium Rich. ex DC., Rhombolobium Rich. ex H.B.K., Ternatea Tourn., Ternatea Tourn. ex Mill., Vexillaria Eaton, and Vexillaria Raf.

Clitoria includes fifty-eight species and fifty-one nontypical subspecific taxa. Forty-six species are native to the neotropics and subtropics. One paleotropical species has been introduced and naturalized in many regions of the neotropics. One species is native to temperate North America and to tropical Southeast Asia. Eleven species are native to the paleotropics in Africa and Madagascar, the Indian subcontinent, Indonesia, and Arnhem Territory of northern Australia. Two neotropical species have been introduced and naturalized

in portions of Africa and Indonesia. One species is introduced and naturalized in many Pacific islands.

A history of Clitoria is provided in which the origin of the generic name is traced to Breyne in 1678. A detailed morphology of the genus is presented. Cleistogamous flowers, as well as chasmogamous flowers, are noted to occur in thirteen species. Species of Clitoria are recorded to have economic uses as medicinal plants, ornamentals, aphrodisiacs, poisons, pesticides, dyes, fibers, food, fodder, and green manure. Prior research on species of Clitoria is summarized in the areas of agronomy, anatomy, chemistry, cytology, developmental botany, morphology, and palynology.

A systematic treatment is given which recognizes three subgenera and eight sections. These include sections Bractearia (7 spp.), Flexuosa (3 spp.), Brachycalyx (7 spp.), and Cauliflorae (12 spp.) of subgenus Bractearia; subgenus Clitoria (5 spp.); sections Mexicana (8 spp.), Tanystyloba (6 spp.), and Neurocarpum (10 spp.) of subgenus Neurocarpum. Each species is described and illustrated. A complete synonymy is given. A nomenclatural discussion of type collections, phenology, distribution, subspecific taxa, and citation of examined specimens is provided under each species. Economic importance and vernacular names are included for a species when known. Each taxon has a mapped distribution. Keys are provided to each taxonomic level.

Phylogenetic considerations are given based upon the interpretation of morphological data presented in this study. Subgenus Bractearia is regarded as a primitive subgenus with subgenus Neurocarpum as advanced.

## INTRODUCTION

The genus Clitoria contains fifty-eight species located mostly within the tropical belt with a few species distributed within the temperate zone. The bulk of the genus (ca. eighty percent of the genera) is neotropical. The genus is absent from Europe, most of Asia (except the Indian subcontinent), and most of Australia. Although there is no universal name by which the genus is commonly known, the most often used vernacular name for the genus is "butterfly pea." Centrosema, a close morphologically and historically related genus, bears the same vernacular name or is sometimes distinguished as the "spurred-butterfly pea." When horticulturalists attempted to standardize plant names (Kelsey and Dayton, 1942), they adopted "butterfly pea" for the genus Centrosema and adopted "pigeon wings" for the genus Clitoria, the latter name rarely used by botanists.

The Papilionaceous genus Clitoria is included by most botanists within the tribe Phaseoleae, subtribe Glycineae. In the few traditional tribes, a number of genera are usually included in a list of exceptions to the typical tribal descriptions. In order to reduce the number of exceptions, Hutchinson (1964) elevated a number of subtribes to the tribal level. Thus, he placed Clitoria within the tribe Glycineae.

Flowering plants of Clitoria are easily determined in the field by a few unusual characteristics. Papilionaceous, resupinate flowers

which have a bearded, geniculate style identify the genus. Specimens in fruit become more difficult to recognize due to the variation of the legume. However, odd-pinnate compound leaves (usually 3-foliate), persistent stipules, stipels, bracts, and bracteoles, plus a persistent, five-toothed, infundibular calyx are reliable characters that, taken collectively indicate the genus Clitoria from other genera.

The genus Centrosema (Glycineae) is often confused with Clitoria. Linnaeus established Clitoria in his "Species Plantarum" in 1753, and included four species. Two of those species, C. brasiliana and C. virginiana, were later placed in Clitoria section Centrosema by de Candolle in 1825. Bentham (1858) segregated Centrosema from Clitoria and elevated the taxon to the level of genus. In the keys of most floristic and revisionary treatments, Clitoria is distinguished from Centrosema by its "bearded style" or "pubescent style." This character is often misinterpreted. Clitoria can be distinguished morphologically from Centrosema by several characters. These differences are summarized in Table 1.

The last revisionary work on Clitoria was a synopsis published by Bentham in 1858. This treatment included a total of three sections with twenty-six species, more than half of which were originally described by Bentham. Bentham's treatment has been the major reference relied upon by nearly all authors of floristic works that included the genus. Bentham's treatment contains a number of deficiencies, however, and now includes some conflicts with the International Code of Botanical Nomenclature (Stafleu, 1972).

A number of problems presently exist within the genus that need resolution, and these can be categorized into six areas. One problem

Table 1. A morphological comparison of the genera Clitoria and Centrosema

<u>CHARACTER</u>	<u>CLITORIA</u>	<u>CENTROSEMA</u>
Calyx	Infundibular, lobes broad, shorter than to nearly equal tube length (rarely longer)	Short-campanulate, lobes narrow, equal to or longer than tube length
Vexillum	Spurless	Spurred or gibbous
Alae vs Carina	Alae longer than carina	Alae subequal carina
Style	Geniculate, bearded lengthwise to base	Broadly incurved (U-shaped), pubescent only beneath stigma
Ovary	Stipitate (or subsessile in Subgenus <u>Clitoria</u> )	Subsessile
Legume	Stipitate, ecostate or with 1 lateral nerve near midline of valve	Subsessile, 2 prominent nerves laterally, one near each suture
Leaves	Pinnate - typically 3 (1) leaflets (Subgenus <u>Clitoria</u> commonly 5, 7, 9, or 11 leaflets)	Pinnate - typically 3 leaflets, rarely 5, 7, or 11 leaflets

is the proliferation of names and their delineation into specific and subspecific taxa. Eleven genera must be included in synonymy under Clitoria. Bentham cited only two, although by tracing back through his cited references, the genera included in synonymy increased to six. To date, nearly two-hundred and fifty published binominals (plus ca. twenty nom. in sched.) are included within the total concept of the genus Clitoria, senso lato. Of these, one hundred and sixty of the binominals were published under the name Clitoria. Bentham included only sixty of these binominals in his treatment, and since Bentham's revision, nearly fifty new species have been described, almost double the total number of species that he recognized. Bentham did not include subspecific taxa in his synopsis. Twenty-one of the twenty-three subspecific taxa published were described after Bentham's treatment.

A second problem is the lack of complete and detailed descriptions of species, one probable cause of the large abundance of names. Few of the published specific names were accompanied by detailed descriptions. Many were published with short diagnostic descriptions that included a number of characters that are typical of the genus or subgeneric groups. Many of the descriptions contain relative terms (i.e. short vs. long, large vs. small) and lack precise measurement ranges. Often a character included in one description is lacking in the description of another species.

Some floristic treatments have included descriptions of their species, occasionally offering more detail than the original description. These descriptions can be helpful, but a few have compounded the problem. An example would be Macbride's treatment

(1943) of the Peruvian species of Clitoria. Many of the specimens examined by Macbride had been misidentified and did not match the type collections. This has resulted in descriptions placed under inaccurate names (e.g., C. amazonum and C. nervosa, neither species occurring in Peru).

A third problem that occurs in conjunction with the first two is the lack of keys to the species of Clitoria. Bentham did not include a key in his treatment, although he used some diagnostic phrases that separated the species into groups. The only keys that exist are those found within certain floras. Keys which included five or more species of Clitoria are found in floristic treatments for only a few countries in South America, a few in Central America, plus one treatment for Southeast Asia. They often include characters which work well locally, but not when more species are added from neighboring areas.

A fourth problem is incomplete information on types. A number of species had incomplete citations, making type interpretation difficult. Bentham was partially responsible in that he often paraphrased data from herbarium labels. Specimens labeled as "type" in the personal herbarium of Bentham and in other herbaria which he examined, often bear a collection number or date which Bentham did not cite. Occasionally type information has been distorted. For example, Howard (1967) proposed the name C. fairchildiana as a substitute for the homonym C. racemosa Benth., correctly citing the Brazilian type collection of Pohl. Then he distributed specimens (Howard 17052) from a cultivated tree at the Jennings Estate in Miami, Florida, United States, as the type tree.

A fifth problem is the number of species that bear illegitimate names as defined by the International Code of Botanical Nomenclature. Although Bentham was not bound by a code developed nearly a century after his revision, he did select names by a process that conflicted with the Code standards in practice today. Later botanists who assumed that those names were acceptable under the Code have often been unaware of these differences and have used names that cannot stand today.

A sixth problem is lack of information as to the geographic distribution of the species. Distribution statements have often been based upon one or a few collections and appear to sometimes have been wholly hypothetical. The problem has been compounded in some species which were described originally from cultivars outside the normal distribution range (e.g., C. arborescens). Distributions in some species have been distorted when floristic treatments have mistakenly included a species within their geographical areas or inaccurately reported the species from other areas.

This author has examined nearly eighty percent of the type collections for the two hundred and fifty binominals associated with Clitoria. Many of the types not examined belonged to species described and placed within the genus Clitoria, but later transferred to other genera, often Centrosema. In most cases, descriptions of these species contained diagnostic phrases (i.e. campanulate calyx, spurred vexillum) sufficient to indicate that the species does not belong to the genus Clitoria.

Bentham's section Clitorianthes was most poorly understood. Nearly fifteen percent of the specimens that were examined in this



section were unidentified to species. For those specimens with names, slightly more than fifty percent were misidentified. A large portion of the species in Bentham's section Neurocarpum were also misnamed. However, many of these specimens were correctly identified to species, but bore illegitimate synonyms. Relatively few problems were found within Bentham's section Ternatea.

The purpose of this investigation has been to thoroughly re-examine available specimens and types, to clarify the nomenclature and species descriptions, and to prepare functional keys and illustrations to legitimate taxa.

## ECONOMIC IMPORTANCE

With the exception of C. Ternatea, the species within the genus Clitoria have been of relatively little economic use, except where they are locally important. Clitoria ternatea is important economically as a medicinal herb, as an ornamental, as a food and cover crop, as a dye, as green manure, and as an aphrodisiac. Clitoria ternatea has been prized as a cultivar at least since the late seventeenth century, and has been carried by man throughout the tropics, where it often has escaped and become established. As a result, this species now has a pantropical distribution. Attention has been focused on C. Ternatea as a typical representative of the genus because it is widespread, well known, and easily accessible for economic use. Some species within the genus are reported to have some of the same economic properties as C. ternatea, although these species have not received the same publicity of C. ternatea. Additional properties have been noted for a few species, for example, the possible use as powerful insect and vertebrate poisons.

The genus Clitoria has great potential to be an economically important legume genus. The economic uses of a particular species properly belong under the treatment of that species. The purpose of this chapter is to discuss the economic properties known for the genus and to point the way toward research in the economic botany of Clitoria as a whole. Clitoria ternatea will be the major

representative of the genus in this discussion. Information obtained from herbaria is documented with the collector's name and his collection number enclosed within parentheses, for example, (Hahn 234).

### Medicinal Properties

Nearly all the medicinal properties of Clitoria are recorded for the species C. ternatea as a result of investigations by workers interested in medicinal Indian, Southeast Asian, and Indonesian plant species. Remedies and treatments reported are grouped below by medicinal use for each plant organ used.

#### Roots

Root or root bark is often reported to be an effective laxative, but may not always be safe. The degree of cleansing action varies in the reports. Dalgado (1896), Kirtikar and Basu (1918), and Dutt (1928) report use of the roots as a laxative. Kirtikar and Basu (ibid) cited Mr. Mooden Sheriff (1891) who noted that the root bark was a laxative in some cases. Chopra, Chopra, Honda, and Kapur (1958) noted that the root bark was used as a laxative. Chopra, Badhwar, and Ghosh (1949) and Chopra, Chopra, Honda, and Kapur (ibid) reported the roots as a powerful cathartic similar to Jalap (Exogonium purga, Convolvulaceae), but that it was not a safe medicine. Dey (1896), Burkill (1935), Quisumbing (1951) citing Dey, and Gardner and Bennett (1956) reported the roots as cathartic. Dey reported preparing the remedy as an alcoholic extract of the roots. Quisumbing (ibid), citing Rajan (1926), reported the roots as a purgative and narcotic toxin. Rajan (ibid) indicated symptoms of the narcotic poisoning to

include unconsciousness attended with extreme irritability and a peculiar loss of memory. Chopra, Badhwar, and Gosh (ibid), citing O'Shaughnessy (1841), indicated that an alcoholic extract of the root acts as a brisk purgative in doses of five to ten grains, but produces gripping and tenesmus, and the patient will feel feverish and uneasy. Quisumbing (ibid), citing Rajan (ibid), Sanyal and Ghose (1934), and Burkill (ibid), reported the roots as an aperient. Roots were noted to be a purgative medicine or remedy used in Martinique (Hahn 234).

Roots are also used in stimulating urination and are useful in ascites and fevers. Rajan (1926), Dutt (1928), citing the Hindus, Sanyal and Ghose (1934), Quisumbing (1951), citing the three earlier works, and Chopra, Chopra, Honda, and Kapur (1958) reported the roots as diuretic. Chopra, Chopra, Honda, and Kapur (ibid) also reported the root bark used as a diuretic. Kirtikar and Basu (1918), citing Sanskrit writers, described the root as diuretic, useful in ascites (an accumulation of excess fluid in the abdominal cavity) and fever. They also cite Mooden Sheriff who noted that an infusion of the root bark acts as a diuretic.

Quisumbing (1951), citing Sanyal and Ghose (1934) who cited Mooden Sheriff (1891), and Kirtikar and Basu (1918), who also cited Mooden Sheriff, reported that Sheriff spoke highly of the infusion of the root bark as a demulcent in cases of irritation of the bladder and of the urethra.

Roots are also used as a medicine in promoting menstrual discharge. Quisumbing (1951) cited Crevost and Pételot (1929) who reported the roots used as an emmenagogue.

Roots or root juice has been reported to cause nausea and vomiting and to be useful for lung ailments and removing the phlegm of chronic bronchitis. Lindley (1938) and Gardner and Bennett (1956) reported the root as an emetic. Quisumbing (1951), citing Dalgado (1896) and Crevost and Pételot (1929), indicated that each reported the roots used as a vomitive. Drury (1873) and Dymock (1885), each cited by Quisumbing (ibid), quote Mr. Ainslie (1826) who mentions the use of the root in soup to remove phlegm in chronic bronchitis and to bring on nausea and vomiting. Kirtikar and Basu (1918), citing Dymock (ibid), indicated that in the Concan region of India, two tolas<sup>1</sup> of the root juice are given in cold milk to remove the phlegm of chronic bronchitis through nausea and vomiting. Chopra, Badhwar, and Ghosh (1949) indicated that opinions differed with regard to the emetic properties of the root. In the Sudan, the roots are chewed for lung and throat complaints (Prichard 4).

Dymock (1885), cited by Kirtikar and Basu (1918), indicated that the juice of the root of a white-flowered form of C. ternatea is blown up the nostrils as a headache remedy. A similar practice in the Sudan has other effects. Before a cow is sent to the bull, the root is chewed and blown up her nostrils to ensure fertility (Pritchard 4).

Roots are reported to be used as an antidote against snake-bite and scorpion-stings. Chopra, Badhwar, and Gosh (1949) reported the roots as a possible antidote against snake bites. Chopra, Chopra, Honda, and Kapur (1958) reported that the roots were used in Indian

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1. A tola is an Indian unit of weight equal to one silver rupee, or 180 grains.

indigenous medicine as a treatment for snake-bites (Cobras and Daboias) and for scorpion-stings (genera Buthus and Palamnoeus). However, they found that remedies administered to dogs and rabbits injected with the snake or scorpion venom in strict conformity with the directions given in standard Indian medicinal books, had no preventive, antidotal, or therapeutic effect.

#### Leaves

The leaves are reported to be used against eruptive conditions by Chopra, Badhwar, and Ghosh (1949). Kirtikar and Basu (1918, citing Watt (1889-96), and each later cited by Quisumbing (1951), reported that an infusion of the leaves is used for eruptive conditions.

Heyne (1927), later cited by Burkill (1935) and Quisumbing (1951), reported that the leaves of a white-flowered form of C. ternatea are used as poultices in Java. Kirtikar and Basu (1918) and Quisumbing (ibid), each quoting Mr. Taylor,<sup>2</sup> stated that the juice of the leaves mixed with green ginger is administered in cases of colliquative sweating in hectic fever. Quisumbing (ibid) quoted Kirtikar and Basu (ibid) who quoted Mr. Mokerji (1889-1904) in "Watt's Dictionary" that juice of the leaves is mixed with common salt and applied all around the ear for earaches, especially when accompanied with the swelling of neighboring glands. Quisumbing (ibid) quoted Tavera (1892) who reported that the leaves are used in the Philippines for swollen joints. Chopra, Chopra, Honda, and Kapur (1958) reported that the juice of the leaves is mixed with water to form a jelly which is taken

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2. Taylor was quoted by both authorities; however, neither one documented the reference source of Taylor.

as a cooling medicine for gonorrhea, and used externally for eczema, prurigo, and impetigo.

### Seeds

Seeds are used also as a laxative and considered as an effective, safer method than the use of roots or root bark. Waring (1868), Drury (1873), Dey (1896), and Crevost and Pételot (1929), each cited by Quisumbing (1951), reported that seeds are used as a mild purgative. Quisumbing (ibid) also cited Kirtikar and Basu (1918) who reported the seeds as a purgative and an aperient. Chopra, Badhwar, and Ghosh (1949) indicated that seeds in powdered form have purgative and aperient properties, and are considered more useful and a safer medicine than the roots. Quisumbing (ibid) cited Burkill (1935) who reported that the seeds are used as an aperient and contained a toxic alkaloid. Quisumbing (ibid) cited Nadkarni (1927) who reported that the seeds contained a fixed oil, a bitter acid resin, tannic acid, glucose, and six percent ash. The testa was brittle and contained cotyledons full of granular starch. Chopra, Chopra, Honda, and Kapur (1958) cited Dymock, Warden, and Hooper (1890-93) who reported that the seeds contained a fixed oil, a bitter resinous principle, and tannin. (Chemical investigations on the seeds are reported under the chapter "Prior Research on Clitoria." (Refer to that chapter, subheading "Chemical Research," for details.)

Burkill (1935) quoted Tavera (1901) who reported that the seeds are used in the Philippines as poultices for swollen joints. In an earlier edition of his book (1892), Tavera had attributed this medicinal property to the leaves.

Seeds are supposed to be effective in destroying or expelling tapeworms. Waring (1868), Drury (1873), Dey (1896), and Crevost and Pételot (1929), each cited by Quisumbing (1951), reported that the seeds were used as an antihelminthic.

#### Flowers

Burkill (1935) cited "Medicinal Book of Malayan Medicine (Gard. Bull. S.S. 6, 1930, p. 381)" which reported that the floral juice of a white-flowered form of C. ternatea was used for inflamed eyes.

#### Additional Notes

Chopra, Chopra, Honda, and Kapur (1958) reported that C. ternatea is alleged to have anti-dysenteric and anti-tubercular properties. No plant organ was noted.

#### Aphrodisiacs

A few species are reported to ensure fertility and are used as sexual stimulants. This topic is usually not included in the literature possibly through delicacy complicated by the fanciful resemblance of the flower to the female sexual apparatus. Yet, in widely dispersed geographical areas with different species, the native people use Clitoria plants as aphrodisiacs for man and domestic animals. It is presumed that the natives follow the ancient principles of the Doctrine of Signatures, which is based upon belief that the plant structures which resemble portions of the human body have been so structured as to advertise their ability to provide remedies for ailments of those body portions.

The use of the plant in conception was implied by Rumpf (1747) who noted that the Portuguese name "Fula criqua" was derived from the



flowers, and that Breynia (1678) had appropriately named the plant Flos clitoridis ternatensibus (this plant now known as Clitoria ternatea). The Portuguese translation of "Fula criqua" means "to speed or hurry-up creation." In the Sudan, before a cow is sent to the bull, the root of C. ternatea is chewed and blown up her nostrils to ensure fertility (Pritchard 4). Near Anaconda Island on the Rio Napo, Ecuador, this author attended a wedding presided over by a tribal witch-doctor. In a discussion with him the night before the wedding, the flower of C. pozuzoensis (a species that this author was searching for locally) was described by cupping the hands for the vexillum and the arching of the thumbs for the keel and wings. The grinning witch-doctor apparently recognized the plant in question immediately. He accurately described its white flowers, climbing habit, and vegetative morphology. He reported through the translator that he gave this plant to couples that had difficulty bearing children.

In Minas Gerais, Brazil, catuaba (C. guianensis) is put in cachaca "to make a man out of you" (Williams, Assis, and Moreira 5416), which the collectors noted that the effect was "Potencia"!

#### Ornamental Properties

Most of the species of the genus Clitoria have potential for becoming economically important as ornamentals because of their large and beautifully-colored, showy flowers and the various habits they possess. Frequently prized are those species which display climbing habits, used commonly for garden trellises, and less frequently on other vegetation. Also much esteemed are those species which possess

the "azure blue" flowers and those of "delicate shades of pink." Other species are noted for their foliage. A few examples will be cited here.

The oldest and most widely cultivated ornamental is C. ternatea. This species is probably indigenous to Eastern Africa with subsequent expansion into central and western Africa and the Indian subcontinent. Man has transported this species throughout the tropical belt where it often has escaped and become established as a wild plant. Today it is commonly cultivated and is found wild in many Pacific Islands, in portions of Australia, Indonesia, Africa, and the Americas, and in the Antilles. Breyne (1678) reported the species as a cultivar, taken from the Mollucan island of Ternate and planted in European gardens, where Curtis (1812) reported that it needed protection from the climate, and that it would not set seed. Because of its brilliant blue flowers of large size which bloom nearly year round, it is a popular cultivar in tropical regions, growing rarely as a small shrub, but most commonly as a perennial climber. The plant grows rapidly, forming many intertwined stems, and when placed upon open ground, develops tangled mats. It can be trained through cutting to form low-growing shrubs. The white-flowered and pale blue-flowered strains are not as popular as the azure blue-flowered strains.

Clitoria ternatea is also important because of a double-flowered variety. These plants produce large, actinomorphic, free, banner-like petals of deep azure to bright purple colors, and rarely white flowers. This variety was first reported by Commelin (1701). Today it is commonly cultivated and is naturalized in portions of the Caribbean, Sri Lanka (=Ceylon), and Indonesia, with isolated populations elsewhere in the neotropics.

Another early prized ornamental was C. heterophylla which was reported by Curtis (1820). This species is endemic to the islands of Madagascar and Mauritius. It is valued for its climbing habit, blue flowers, and unusual pinnate leaves of two distinct shapes found upon a single plant.

The most commonly cultivated, erect plant species has been C. laurifolia (synonym: C. cajanifolia). It is native to the neotropics and introduced into central Africa (naturalized in Zaire) and Southeast Asia-Indonesia. In the latter areas, it is cultivated as a shrub with several plants often planted closely together to form a hedge.

Two woody lianas from the neotropics are popular in protected gardens: C. arborescens of northern South America has large leaves, silky beneath, many racemes of numerous purple flowers, and it is a tall climber; C. javitensis of South America and Panama is valued for its climbing habit and numerous lilac to delicate pink shaded flowers. A less popular liana species, C. lasciva, a native of Madagascar, is valued for its luxuriant foliage and blue flowers.

The tall erect shrub of C. amazonum is desirable in protected gardens because of its erect habit with upper branches climbing, and its huge, showy, purplish flowers which are numerous in each of many inflorescences.

Clitoria fairchildiana (synonym: C. racemosa Benth.) is a popular tree species. It is endemic to the deltas of the Amazon River and the other large rivers to the southeast. This tree is planted extensively along beach roads in Rio de Janeiro, and valued for its elongated racemes of numerous purple flowers, and for the luxuriant

foliage borne on branches which arch and droop to the ground, forming a canopy.

### Poisons and Pesticides

Several species are known to have toxic properties. It has already been pointed out (Rajan, 1926) that the roots of C. ternatea taken as a purgative can produce narcotic poisoning in man. Chopra, Badhwar, and Kapur (1949) included C. ternatea in a list of important plants poisonous to man and livestock.

Gardner and Bennett (1956) reported that C. arborescens was used as a fish poison, the seeds containing alkaloids with weak curariform action. The seeds of a related species from Colombia, C. arborea, were reported as alkaloid positive (Schultes 24120). In Amazonas, Brazil, C. froesii was reported as being considered the most toxic plant in the region of Rio Icana, and was planted by the Indians and found in fair quantities (Fróes 12441/185).

The genus is not noted for its pesticidal properties, although some species contain the insecticide ingredient rotenone. In Surinam, the stems and fleshy roots of C. falcata have a strong odor of rotenone (Archer 2848). A cultivated population of C. laurifolia in São Paulo, Brazil, was noted not to be attacked by fungus or insects (Norris 278). In Thailand, tuber juices of C. macrophylla are sprayed on vegetables to kill green flies and root juice is used to kill worms in the backs of buffaloes (Collins 1441).

### Dyes and Fibers

Clitoria ternatea is the only species of the genus that is reported to be used as a dye plant. Rumpf (1747) and Uphof (1968) reported that in the Moluccan island Ambon, the flowers were boiled with rice to give the rice a blue tinge. Burkill (1935) reported identical use in Malaya. Burkill also noted that the juice of the leaves is used on some occasions in the Dutch Indies to color food green. He also reported that the flowers were used as a dye to give a temporary color to white cloth. The dye was used in the Rhio Archipelago (=Riouw Archipelago, a portion of the Malaya Archipelago) and as a reagent for detecting acid and alkaline solutions, as does litmus paper.

Liana species are used locally by the natives to make ropes. Uphof (1968) reported that C. lasciva stems are the source of a fiber used by natives of Madagascar for making ropes. Clitoria sagotii was noted as a bush rope by Jenman 4930, in Guyana.

### Food for Man

Uphof (1968) reported that the pods of C. ternatea are consumed as boiled vegetables.

### Fodder and Green Manure

A number of references report that C. ternatea is a good forage crop and is edible by cattle, sheep, and goats. Burkill (1935), for example, reported that sheep and goats will eat the foliage. In Venezuela, the species is used as a forage crop (Zambrano 105). Several experimental studies have reported on the establishment of

these species in pastures, and other studies indicate its nutritional value. These studies will be detailed in the later chapter "Prior Research on Clitoria," under the section "Agronomical Research."

Burkill (1935) reported that C. ternatea has been used as a green manure, but that it climbs too much, although it was fairly successful in some respects, on land that was to be fallow for a short time. Burkill (1935) reported that C. laurifolia was only fair as a green manure and that better plants existed for the purpose. Uphof (1968) reported that this species was used as a green manure in warm countries. Holland and Joachin (1933) found that C. laurifolia was well adapted as a hedge plant to control terraces on steep slopes in tea plantations in Ceylon (=Sri Lanka). Burkill (1935) noted that the erect stems made this species well suited as a hedge plant on contoured terraces.

## HISTORY OF CLITORIA

The history of Clitoria begins nearly a century before its officinally recognized origin in 1753. Although nomenclaturely irrelevant, the pre-Linnaean names published and the accompanied data presented provides better understanding of the genus and its close relationships with the genus Centrosema.

### Origin of the Generic Name

The debatable origin of the generic name has been a very distasteful subject to many botanists in the past. The most commonly supposed origin of the name is from the Latin "clitoris," an anatomical term by which it is indicated that the flower bears a resemblance to the human female sexual apparatus. This unscientific notion of comparing the flower with the female reproductive organs, a practice noted by some as one of questionable taste or immoral behavior, has been disturbing to a number of botanists. Solutions to this problem have been various. First, ignore the problem by making no reference to the subject. Second, circumvent the issue by concluding that the origin of the name is lost in history, and today has no significant meaning. Third, gently touch upon the problem by indicating that the origin is from the flower's fantasized resemblance to "a female organ," or to "a female structure," or to "an organ." Fourth, circumvent and attack the problem by indicating that the

origin is from the Greek "cleisto: to enclose" which refers to the manner in which the organs of fructification are enclosed within the keel. Or one can use as the origin, Clitor, a town in Arcadia (Stearn's "Botanical Latin," 1966, has Arcadia = Arkadhia, Peloponnisos, S. Greece, a European country side outside the distribution of the genus). Fifth, a direct attack upon the problem by indicating the immoral practice and unscientific method of selection of the generic name, which should be selected to reflect some botanical structure, to reflect a geographic origin, or to honor a distinguished person by naming the genus after him. Hence the genera established as substitutes, Ternatea Tourn. for Clitorius Petiver, and Nauchea Desc. and Vexillaria Eaton substituted for Clitoria L.

To this author, it seems clear that the origin of the name can be traced to Breyne (1678) who published Flos clitoridis Ternatensibus for an exotic cultivar from the Moluccan island of Ternate. He indicated the vernacular name to be "Bokyni cotele de Principisse Clitoris." Rumpf (1747) expanded upon this by indicating the Ternatice names to be "Saja Cotele" and "Bokyma Cotele" from which Breyne erected Flos clitoridis (flowers clitoris-like) based upon clitoris principisse (or origin from clitoris), and from which the Portuguese name, Fula criqua (to speed or hasten breeding or creation) were derived and appropriately named. The Portuguese and Ternatice names were probably based upon the ancient "Doctrine of Signatures," a belief that plant structures which resembled human structures were created to furnish remedies for the ailments of those body structures. A number of Clitoria species are used as aphrodisiacs, both for man and for animals, in widely separated geographical areas and cultures. Breyne



evidently recognized a resemblance in the flower to the female anatomy as others had, because he incorporated the concept that the flowers were clitoris-like in his polynominal name.

### General History

Breyne (1678), a German botanist, was the first to describe and to illustrate a representative of the genus Clitoria. In "Exoticarum Plantarum Centuria Prima" he described a plant, from the Indian subcontinent and transferred to Europe for cultivation, as Flos clitoridis Ternatensis. Breyne described the showy papilionaceous flowers as inverted, with the vexillum ventrally located, a unique characteristic that segregates Clitoria from most other legumes. However, in the excellent illustration (plate 41, drawn by Stech<sup>1</sup>), the flowers are not resupinate (possibly an artist's or engraver's error). The vexillum appeared dorsally as in typical papilionaceous flowers. Breyne's description included habit, calyx, bracteoles (Breyne used the term "leaflets"), and fruit (not illustrated), major characters used by later authors in segregating Clitoria species. The illustration clearly shows the odd-pinnately compound leaves and persisting bracts and stipules (the stipules are drawn too large for the species), additional characters used early in the determination of species. Breyne's representation is easily recognized as Clitoria ternatea L., the type species for the genus. Breyne reported the plant from the Moluccan island of Ternate, and cited that it bore the name

1. Hunt Bot. Cat. 1:374 attribute drawing to Andreas Stech and engraved by Issac Saal. Plate bears initials "AS" at left bottom, "IS" at right bottom.

of "Bokyni Cotelé de Principisse Clitoris," the source for Breyne's polynominal name. Breyne reported a collection by Sevenhuysen in 1667 from Domingo (=Dominican Republic) as related to the Ternate specimen. If verified as a Clitoria, it would represent an earlier record of the genus.

Breyne also described and illustrated (plate 32) a second representative as Planta Leguminosa Brasiliana, Phaseoli facie, flore purpureo maximo. This specimen provided the earliest record of the species known as Clitoria brasiliana L., later transferred to and becoming the type species of the genus Centrosema.

Plukenet (1691) in his "Phytographia" described and illustrated Foenum graecum phaseoloides Virginiana flore amplo caeruleo. This is the earliest record of the species known as Clitoria virginiana L., later correctly transferred to the genus Centrosema.

Petiver (1704) in his Appendix to his "Catalogus Plantarum Hortis Siccis Petiverianus" published two polynominals, both lacking additional data. His number 54 was Clitorius Marianus trifoliatu viridis. No record of this polynominal has been found cited after this date. His number 55 was Clitorius Marianus trifoliatu subtu glaucu. This is the earliest record of the species known as Clitoria mariana L. Petiver was the first to use Clitoria or a form of the basic root word as the "generic" name.

Tournefort (1706) in his article "Suite de L'établissement de quelques Nouveaux Genres de Plantes" described the genus Ternatea. He provided an illustration of the flower with calyx, individual petals, fruit, and seeds. Three members of the genus were included. His first species was Ternatea flore simplici, caeruleo based upon Breyne's

specimen. Breyne's specimen became the type for the genus and the source of the generic name, which Tournefort indicated was named after the Moluccan island of Ternate. Tournefort's second species was Ternatea flore pleno, caeruleo based upon a double-flowered specimen described by Commelin in 1697. His third species was Ternatea flore simplici albido, a white-flowered specimen recognized for the first time. All three species are now Clitoria ternatea L.

Dillenius (1732) in his "Hortus Elthamensis" described and illustrated Clitorius trifolius, flore minore caeruleo. He segregated this specimen from those of Breyne, Petiver and Tournefort, and concluded that it represented a new member of the genus Clitorius as defined by Petiver. His specimen is Clitoria virginiana L., although no reference was made to Plukenet (1691), the earliest describer of this species.

Linnaeus (1737b) in his "Hortus Cliffortianus" became the first to use the generic name Clitoria. He recognized two species. His first species was Clitoria foliis pinnatis, based upon specimens described by Breyne (1678), Rheede (1688), Plukenet (1691), Rivinius (1691) Commelin (1697), Tournefort (1706), Dillenius (1719), and Burman (1737). Breyne's Flos clitoridis ternatensibus was the source of the generic name. Neither Petiver (1704) nor Dillenius (1737), both of whom had used Clitorius, was cited. The diagnosis was based upon Phaseolus foliis pinnatis Riv. The distribution was given as Malabar (S.W. India), Zeylon (=Ceylon, now named Sri Lanka), and Ternate. Linnaeus recognized three varieties. His typical variety had simple blue flowers (=Tournefort's first member). His variety alpha was white flowered (Tournefort's third member). His variety beta had

double blue flowers (Tournefort's second member). In addition, Linnaeus gave a brief Latin description of variety beta. His second species was Clitoria foliis ternatis based upon Breynia's Brazilian specimen and Plumier (1693).

Linnaeus (1748) in his "Hortus Upsaliensis" recognized the same two species, but used binominal names. His first species Clitoria foliis pinnatis became Clitoria ternatea. His species Clitoria foliis ternatis became Clitoria brasiliana.

Nomenclaturally, the official history of the genus began with Linnaeus (1753) in his "Species Plantarum." Linnaeus established the genus Clitoria (p. 753) with four species: C. ternatea and C. brasiliana from his earlier works (1737b and 1748), with the addition of C. virginiana (based upon Dillenius, 1737, and Gronovius, 1739) and C. mariana (based upon Petiver, 1704). His brief Latin diagnosis for each species was based upon leaflet number and calyx shape. India, Brazil, Virginia, and northern America were given as the ranges of his four species.

The International Code of Botanical Nomenclature (Stafleu, 1972) officially recognizes that those generic names which first appear in first edition (1753) of Linnaeus's "Species Plantarum" (e.g. Clitoria) are associated with the first subsequent description given under those names in the fifth edition (1754) of Linnaeus's "Genera Plantarum." Clitoria is described under genus number 796 (p. 334) of Linnaeus's "Genera Plantarum" as:

CAL. Perianthium monophyllum, erectum, tubulatum, quinque-dentatum, persistens. COR. Vexillum maximum rectum, emarginatum, margine undulatum, patens. Alae oblongae, rectae, obtusae, vexillo breviores. Carina

alis breviores. STAM. Filamenta diadelpha (simplex & novemsidum). Antherae simplices. PIST. Germen oblongum. Stylus adscendens. Stigma obtusum. PER. Legumen longissimum, lineare, compressum, uniloculare. SEM. plura, reinformia.

This diagnosis represents the first validly published description of the genus Clitoria L.

Miller (1754) in his "Gardner's Dictionary" provided the first encyclopedic reference work on the genus. He adapted Tournefort's treatment (1706) and recognized the genus Ternatea. Thus, three of the four species he recognized followed Tournefort's treatment, not Linnaeus's (1737) who treated these as three varieties of one species. A fourth species, Ternatea Americana perennis flore caerulea from Jamaica, was included. In a later edition of his work, Miller (1759) adopted Linnaeus's generic name Clitoria and his four species. The three species of Tournefort included in his earlier edition were included as C. ternatea in the later edition. The treatment of the Jamaican species is unclear, as no reference to this specimen was made. It may have been included under C. brasiliensis or C. virginiana, or treated under another genus, but it could not have been included in C. mariana, a species which does not occur in Jamaica.

Miller described the flower as papilionaceous, with the vexillum longer than and hiding the keel and wings, the fruit opening by the sutures, and the seeds kidney-shaped. The first description of the stamens and stigma were given. He referred to the flower as a butterfly type.

Buchoz (1775) in his "Histoire Universelle du Règne Végétal ou Nouveau Dictionnaire Physique et Économique de toutes les Plantes qui Croissent sur la Surface du Globe" became the first to describe the

genus Clitoria in greater detail. Clitoria was described as: calyx tubular, 5-toothed, persistent; corolla papilionaceous; vexillum very large, straight, notched, with undulating margins; wings oblong, straight, obtuse, much shorter than standard; carina much shorter than wings, round underneath, furrowed; stamens diadelphous, anthers simple; ovary oblong, style ascending, stigma obtuse; legume very long, linear, flat, bivalved, awl-tipped; seeds numerous, reniform. Buchoz followed the Linnaean treatment and included five species, C. ternatea L., C. brasiliensis L., C. virginiana L., C. mariana L., and C. galactia Crantz. Each species was described with notes on origin, culture, and economic importance.

Lamarck (1786) in his "Encyclopédie Méthodique, Botanique" described seven species, of which Clitoria heterophylla (East Indies) and Clitoria falcata (Santo Domingo) were newly described. Descriptions lacked measurements, but included habit, stem, leaf shape and pubescence, leaflet number, peduncle location and relative size as compared to petiole size, calyx, flower size and color, and fruits. All sizes were relative and compared to similar structures of other species. These characters, along with the addition of bracteoles and stipules, were to become the major characters utilized by later authors in describing and segregating Clitoria species. Lamarck's style of describing Clitoria species established a trend that continued through Bentham's revision of the genus in 1858 and beyond. Poiret (1811), in a supplement to Lamarck's work, described three new species and brought the total number to thirteen.

Desvaux (1813) in his journal article "Précis de Caractères de plusieurs Genres, de la Famille des Légumineuses" described a new

genus Neurocarpum, with a tubular calyx of five, equal teeth and a stalked fruit characterized by a longitudinal nerve on each side. He indicated Aublet's Crotalaria gajanensis<sup>2</sup> (published by Aublet as Crotalaria guianensis) and a new species, N. ellipticum Desv., were placed in the genus. In a succeeding article a year later, Desvaux (1814) described the new species N. ellipticum and included Crotalaria guyanensis Aubl. and Crotalaria longifolia Lam. as synonyms of a species called Neurocarpum janense Desv.

Eaton (1817) in his "Manual of Botany for the Northern States" established the genus Vexillaria as a substitute for Clitoria because J. E. Smith severely censured the name Clitoria (reference of the name reflecting the female anatomy) in Rees' "Cyclopaedia" (1807).<sup>3</sup> Rickett and Stafleu (1959), in an expanded footnote regarding Vexillaria Benth. (=Centrosema), quoted Smith as:

CLITORIA, in Botany, (from χλειω, claudio, includo), expressing the manner in which the essential organs of fructification are enclosed or shut up in the keel and wings of the corolla. Whatever may have been in the thoughts of Petiver, by whom the name was first introduced into botany; or of the illustrious naturalists, by whom it has since been continued, reformed, or sanctioned, we cannot refrain from entering our decided protest against every attempt to associate it directly with an anatomical term, to which, though derived from the same Greek theme, it has in fact only a very remote,

2. Desvaux erred in his interpretation of Aublet's species. Desvaux's type (P-591) does not agree with Aublet's type (BM!). Therefore, Aublet's name is not synonymized with Desvaux's name. A complete discussion can be found under the type treatment of subgenus Neurocarpum, p. .

3. This author has not been able to obtain a copy of Eaton's publication, nor Smith's article. However, a copy of the eight edition of Eaton's Manual (1840) has been obtained. Clitoria was not mentioned. Vexillaria Eaton contained three species, V. virginiana, V. mariana, and V. plumieri, each treated as a Clitoria species by almost all other botanists.

fictitious analogy. It is greatly to be lamented, that a fondness for these gross allusions should ever have been indulged by any, who, in all other respects, have deserved highly of natural science, and whose splendid talents should have rendered them far superior to such grovelling ideas. By this conduct they may have done all in their power to pollute a study, which is, perhaps, more than all others, suited to the lowliest part of the human race, and which, without concealing any essential part of the sexual system, may easily be so conducted, as not to excite an unpleasant sensation in the most delicate female mind. We do not mean to exempt from the full severity of this censure our great master, Linnaeus, himself; for when, not only the purity of moral feeling, but also the common decorum of polished life, is infringed, the *nullis in verba* of the poet will, we trust, be uniformly our principle and our practice).

Vexillaria Eaton does not appear in Willis' Dictionary, Index Kewensis, Gray Card Index, nor other standardized index references, nor in articles associated with Clitoria. Vexillaria Eaton apparently was not accepted by other botanists of the time, and was thus easily overlooked by the compilers of the major index references. Vexillaria Eaton is a probable synonym of the genus Clitoria.

Rafinesque (1818) in a two-line note in a journal article remarked "Clitoria mariana must form a particular genus Vexillaria." Thus Vexillaria Raf. was established and recorded by the major standardized index references. Other botanists did not agree with Rafinesque and neither Vexillaria mariana Raf. was used nor were other species of Clitoria transferred to the genus Vexillaria Raf.

Leandro do Sacramento (1821) in a journal article described a new species under a new genus Martia, named in honor of the German botanist Carl F. P. Martius. The description of Martia physodes was detailed with an illustration provided. The generic characters which indicated a distinct genus were the lack of a corolla, small stamens with



rudimentary filaments, a style in contact with its own anthers, and a legume with a protruding lateral nerve. The description was based upon a cleistogamous flowering collection of Clitoria falcata from Brazil.

Schultes (1822) in his "Mantissa in Volumen Primum Systematis Vegetabilium" published the species of Leandro do Sacramento under the name Martiusia physalodes. Perhaps Schultes changed the generic name because of the homonym Martia Sprengel (1819) which is synonymous with a non-legume genus.

Humboldt, Bonpland, and Kunth (1824) in their "Nova Genera et Species Plantarum" described four new species of Neurocarpum. A new genus was cited in synonymy as "Rhombolobium Rich. mss.," probably based upon a Paris specimen of Richard (P-52!) whose label bears the generic description of Rhombolobium, and less likely based upon a Geneva specimen of Richard (G-545!) whose label bears the data "Rhombolobium Richard, genre nouveau qui doit etre place a coti du Clitoria. Il y a un angle que . . . [handwriting illegible for this term] du milieu du Legume du chaque coti." Clitoria L. and Ternatea Tourn. were treated as distinct genera by Humboldt, Bonpland, and Kunth.

A. P. de Candolle (1825) published the first major revision of Clitoria in his "Prodromus Systematis Naturalis Regni Vegetabilis." Almost published simultaneously was his "Memoires sur la Famille des Légumineuses" which gave explanations of his reasons underlying the classification adopted in his "Prodromus." A. P. de Candolle characterized the genus Clitoria as: calyx of five teeth with a pair of bracteoles at its base; the corolla and stamens inserted at the

calyx base at a point visible to the exterior; a large round standard; a style more or less dilated at the summit; a resupinate flower; and a fruit of two valves with seeds separated by a cellular partition. The genus Ternatea Tourn. was placed in synonymy. A. P. de Candolle recognized four sections within the genus, segregated by the calyx shape, bracteoles, presence or lack of a vexillum spur, and a leaflet number.

A. P. de Candolle called section I "Ternatea," based upon Kunth's treatment of Ternatea in 1824. This section was characterized by a tubular calyx, spurless vexillum, and five or seven leaflets. Two species were included, Clitoria heterophylla Lam. and Clitoria ternatea L. A. P. de Candolle named section II "Euclitoria," based upon his statement that this section included the true clitorias. Section II was characterized by a tubular calyx, spurless vexillum, and three leaflets. Six species were included: Clitoria mariana L., Clitoria mexicana Link, Clitoria angustifolia H.B.K., Clitoria formosa H.B.K., Clitoria glycinoides DC., and Clitoria poitaei DC., the latter two newly described species. It should be noted that the type species for the genus, C. ternatea L., is not in this section, and thus the section cannot contain the "true" clitorias. Section III was named "Centrosema" by de Candolle, based upon the spurred vexillum, a unique characteristic in the legumes. Section III was characterized by a campanulate calyx of five divisions, a spurred vexillum, longitudinally striated bracteoles, and three leaflets. Three species were included: Clitoria virginiana L., Clitoria brasiliensis L., and Clitoria plumieri Turp. Section IV was named "Glycinopsis" by de Candolle, based upon the resemblance to the genus Glycine.

Section IV was characterized by a campanulate calyx of five teeth, corolla and stamens inserted at the calyx base, style dilated at summit, longitudinally striated bracteoles, and three leaflets. One new species, Clitoria berteriana DC., was placed here. A. P. de Candolle also noted five additional species that may possibly belong in the genus Clitoria, bringing the total number of species included to seventeen. The five species that were briefly noted, and not placed in any of the four distinct sections, were: Clitoria coccinea Schrad., Clitoria speciosa Cav., Clitoria laurifolia Poir., Clitoria vicioides Nees. & Mart., and Clitoria arborescens Ait.

For each species placed in a section, de Candolle gave a brief Latin description in his "Prodromus." He included the general distribution of the species and cited collections he had seen for the new species.

A. P. de Candolle treated the genus Neurocarpum Desv. as distinct from Clitoria L. in his "Prodromus" following the tradition of other botanists of his time. He characterized the genus Neurocarpum as: calyx tubular with five, subequal, acuminate teeth bearing two bracteoles at its base; vexillum large, subrotund; stamens diadelphous, legume stipitate, compressed, subtetragonous, valves bearing a prominent medial longitudinal nerve; and with seeds in cellular partitions. Seven species were included: Neurocarpum simplicifolium Kunth, Neurocarpum angustifolium Kunth, Neurocarpum guianensis Desv., Neurocarpum ellipticum Desv., Neurocarpum javitense H.B.K., Neurocarpum macrophyllum H.B.K., and Neurocarpum falcatum (Lam.) DC. A. P. de Candolle included a new genus, Rhombifolium Rich., in synonymy based upon a specimen in Richard's herbarium.

A. P. de Candolle treated the genus Martiusia Schult. as also distinct from Clitoria and Neurocarpum. He characterized the genus Martiusia as calyx slightly bilabiate with five teeth, lowermost longer; corolla lacking; stamens four with two sterile and two fertile, subciliate anthers; filaments much shorter than the ovary; legume stipitate, compressed, subtetragonous, bearing a medial longitudinal nerve. A. P. de Candolle noted that the calyx and legume were those of Neurocarpum, and that the genus may not be distinct from Neurocarpum. He included only one species, Martiusia physalodes Schult. The genus Martia Leandr.-Sacr. was treated in synonymy.

Descourtilz (1826) in his journal article "Sur les Nauchées, Genre Nouveau dans la Famille des Légumineuses" criticized the use of the name Clitoria and its reference to an organ from which the name was derived. He felt that the botanical language should consecrate the memory of those illustrious persons of importance by adopting names which recognized their contributions. He proposed the substitution of the name Nauchea for Clitoria. The genus Nauchea was named in honor of M. le docteur Nauche.<sup>4</sup> Twelve species of Clitoria were transferred to Nauchea and a new species was described. Each species included a description and a distribution. Descourtilz gave each species a common name, based upon the specific epithet (i.e. Nauchea multiflora was "Nauchée a fleurs nombreuses"). Other botanists did not adopt the generic name of Nauchea.

Desvaux (1826) in his article "Observations sur la Famille des Légumineuses" proposed a revisionary change in the genus Neurocarpum.

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4. A prominent French physician, Jacques-Louis Nauches (1776-1843), who pioneered work in electrical shock therapy.

Two species were placed near those described in 1813. They were Neurocarpum barbatum Nees, newly described, and Neurocarpum laurifolium Desv., a transfer of Poiret's species (thus should have been N. laurifolium (Poir.) Desv.). Three species were recognized as different. They were Neurocarpum rubiginosum Desv., a transfer of Jussieu's species published by Persoon (thus should have been N. rubiginosum (Juss. ex Pers.) Desv.), Neurocarpum glycinoides N.,<sup>5</sup> a transfer of de Candolle's species (thus should have been N. glycinoides (DC.) Nees), and Neurocarpum villosum N., newly described. Desvaux proposed the name Pilanthum for this group based upon Poiret's name used for the type of C. glycinoides DC. (= N. glycinoides Nees). The genus Pilanthus Poir. ex Endl. (Genera Plantarum p. 1289, 1841), presently synonymized with the genus Centrosema, may be based upon Poiteau's name Pilanthos, although Endlicher's article has not been seen. The specimen referred to by Desvaux and also by de Candolle (Pilanthum cited under C. glycinoides in his Prodrum 2:234, 1825), bears the name Pilanthos tetragonus Poiret. Two new species of Clitoria were also described, C. laurifolia Nees, a homonym for C. laurifolia Poiret (1811), and C. sinuata Nees.

Don (1832) in his "A General History of the Dichlamydeous Plants" followed de Candolle's treatment of Clitoria, Neurocarpum, and Martiusia with minor revisions. Of the five dubious species listed by de Candolle under the genus Clitoria, Don placed two in the section Centrosema (C. speciosa Cav. and C. arborescens Ait.), one in the section Glycinopsis (C. coccinea Schrad.), and left one in a dubious

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5. Desvaux's use of N. was an abbreviation for Nees.

list (C. vicioides Nees & Mart.). The fifth species was transferred to the genus Neurocarpum (C. laurifolia Poir.) along with C. glycinoides DC. from section Euclitoria. He also described two new species, Clitoria racemosa and Clitoria alba, and placed them both in the section Euclitoria. No changes were made in the genera Neurocarpum and Martusia with the exception of the transfers already noted.

Bentham (1837) in a journal article on legume genera followed de Candolle's treatment of these genera with some revisionary changes. There were three major changes in the genus Clitoria. First, Bentham segregated the section Centrosema from Clitoria and elevated the taxon to the level of genus, using de Candolle's name Centrosema. Succeeding botanists have adopted this revision, and presently, more than a century later, botanists continue to recognize both genera, Clitoria L. and Centrosema (DC.) Benth. Second, Bentham eliminated the section Glycinopsis by transferring Clitoriana berteriana DC. to a non-clitorian genus, Periandra, and placed Clitoria coccinea Schrad. in a dubious status. Succeeding botanists adopted this revision as the section Glycinopsis disappeared from literature after this date. Third, Bentham recognized de Candolle's sections Ternatea and Neurocarpum, and added to them a new section, Bractearia Mart. ex Benth. Bractearia was described as fruticose species with trifoliate leaves and bracteoles equal to or longer than the calyx. To this new section, Bentham transferred Clitoria racemosa Don and Clitoria poitaei DC. He also described three new species and placed them in this section, Clitoria amazonum, Clitoria acuminata, and Clitoria arborea.

Bentham's treatment of section Ternatea followed de Candolle and Don with the addition of a new species, Clitoria lasciva Boj. ex Benth. Section Euclitoria underwent minor revision. Clitoria formosa H.B.K. and Clitoria angustifolia H.B.K. were transferred to the genus Centrosema. Bentham added a newly described species, Clitoria pedunculata Boj. ex Benth., to the two remaining species, Clitoria mariana L. and Clitoria mexicana Link. Bentham also added notes on a number of miscellaneous species published as Clitoria, but which had been transferred to other genera.

Bentham's treatment of the genus Neurocarpum followed de Candolle and Don with two important changes. First, Bentham placed the genera Martia Leandr.-Sacr. and Martiusia Schult. in synonymy. Second, Bentham remarked on the close relationship between Neurocarpum and Clitoria by stating that Neurocarpum is a Clitoria except that it has a different legume (i.e. Neurocarpum has a costate legume; Clitoria has an ecostate legume). Eleven species were recognized and placed in two unnamed, artificial groups. Group 1 had suberect stems whereas group 2 had procumbent or climbing stems. Five species were newly described and several species were placed in dubious status.

Bentham (1839), in a publication on British Guianan plants collected by Schomburgk, substituted the name Dendrocyamus for his section Bractearia in the genus Clitoria. He reasoned that the name Bractearia was inappropriate since it had been given to a genus of the Rubiaceae and had been used as a section of the genus Chaetogastra (Melastomaceae).

Bentham (1858) published a second revision of the genus Clitoria in a Journal of the Linnean Society article. This was the last revision

of the genus until this work over a century later, and was adopted by all succeeding botanists in their treatment of the genus. The major change from his earlier revision (1937) was the uniting of the genus Neurocarpum with Clitoria. Bentham reasoned on p. 35:

In a systematic point of view I had formerly endeavoured to render Clitoria more natural, by the elimination of DeCandolle's section Centrosema; and I now find it necessary for the same purpose to unite it with the Neurocarpum of Desvaux, hitherto universally adopted by other botanists, myself included. This entails the giving up, as a generic character, one which, in Leguminosae, is usually considered as absolute, the raised longitudinal nerve or wing along the center of each valve of the pod. It is the same peculiarity which has induced the separation of Tetragonolobus from Lotus among European plants. But in the division of Lotus, as well as in that of Clitoria, this purely technical character is unaccompanied by any other differences, and I now have instances in Clitoria where it is inconsistent in one and the same species, and even on the same specimen.

Bentham continued to recognize three sections, although he changed their names. Section Ternatea remained unchanged, whereas Neurocarpum was substituted for Euclitoria, and Clitorianthese was substituted for Bractearia (= Dendrocyamus in 1839) used in Bentham's earlier revision (1837). No comment was made on the change in section names, nor was there any reference to the earlier sectional names. However, a comparison of the two revisions by Bentham indicated that the sectional diagnosis agreed (although the 1837 description was expanded upon in 1858), the species placed in each section agreed, the order in which each section was treated agreed, and the number given by Bentham for each section agreed.

Section Ternatea was characterized as: stems herbaceous or rarely fruticose, prostrate, twining or climbing; leaflets 5-9, rarely



3; legume valve flat or slightly convex, non-costate, seeds subreniform, compressed, smooth. Six species were recognized, all known previously. They included Clitoria lasciva Boj. ex Benth., Clitoria ternatea L., Clitoria pilosula Wall., Clitoria heterophylla Lam., Clitoria biflora Dalz., and Clitoria pedunculata Boj. ex. Benth.

Section Neurocarpum was characterized as herb, twining or prostrate or short erect; leaflets 1 or 3; legume valve convex, medial longitudinal costa or rarely ecostate; seeds globose, ovoid, or thick subreniform, with a viscid coat. This section contained eleven species placed into three groups based upon the stem habit. The groups were unnamed and distinguished by one to three "\*" symbols. The first group with twining stems included: Clitoria macrophylla Wall., Clitoria mariana L., and Clitoria glycinoides DC. The second group with prostrate stems included two newly described species: Clitoria flagellaris and Clitoria rufescens. Group three with stems arising from a lignose rhizome, erect to ascending, included: Clitoria cajanifolia Presl, Clitoria simplicifolia (Kunth) Benth., Clitoria guianensis (Aubl.) Benth., Clitoria densiflora (Benth.) Benth., and Clitoria stipularis (Mart.) Benth., plus a newly described species, Clitoria nana.

Section Clitorianthes was characterized as erect shrub or tall climbing; leaflets 3; legume valve flat or slightly convex, coriaceous; seeds in matured state unknown. This section contained nine species divided into two unnamed groups based upon the bracteoles. The first group with narrow bracteoles, or bracteoles much shorter than the calyx, included Clitoria polystachya Benth., Clitoria brachystegia Benth., Clitoria arborescens Ait., Clitoria javitensis (H.B.K.) Benth., plus

two newly described species, Clitoria selloi and Clitoria leptostachya. The second group with ovate, coriaceous bracteoles subequal to the calyx, included: Clitoria amazonum Mart. ex Benth., Clitoria racemosa Benth., and Clitoria hoffmanseggii Benth.

The treatment of each species included a Latin diagnosis, the distribution as then known, the citation of one to a few collections, and synonymy. Characters used in the diagnosis of the species included: stem habit; leaf shape and pubescence, and leaflet number; peduncle size, location, and number of flowers borne, calyx; bracteoles; legume curvature and costa; and sometimes stipules or vexillum pubescence. Bentham occasionally gave additional descriptive data with a minimum quantity of measurements.

After Bentham's revision, the next century of publications on Clitoria was mainly of a floristic nature, not revisionary. Isolated descriptions of newly described species placed in the genus also occurred. Two exceptions to the lack of revision are worth noting. First, Baker (1879), in a floristic treatment of legumes in "Hooker's Flora of British India," elevated Bentham's sections to the level of subgenus. Subgenus Ternatea was characterized as having flat legumes without a costa. Clitoria mariana L. and Clitoria macrophylla Wall. were transferred here from Bentham's section Neurocarpum. Subgenus Neurocarpum was characterized as having a turgid, costate legume. Bentham's section Clitorianthes was not treated, probably because the species within this section do not occur in the Paleotropics. Second, Kuntze (1891) transferred all Clitoria species to the genus Ternatea, a revision not adopted by later botanists. Occasionally, floras would include Clitoria and Martiusia as separate genera, the latter genus

containing the species of Neurocarpum (e.g., Small, 1933; Britton, 1924).

In the earlier part of the twentieth century, research in various areas began on Clitoria (e.g., agronomy, anatomy, chemistry, cytology, development). The results of these studies are enumerated in the chapter "Prior Research on Clitoria."

These selected articles represented a partial, highlighted history of the genus Clitoria. The important portions of the nomenclatural history of the genus, above the level of species, are summarized in Figures 1 and 2. For both figures, genera were expressed in capital letters and enclosed in a "box" for better visualization. Genera included in synonymy were enclosed in parentheses. For the few polynomials included, which are important in tracing the origin of some generic names, the key terms are used and underlined, followed by "..." which represented the missing, nonessential terms. Sections are numbered and subgenera are preceded by the abbreviation "Subg."

### Historical Chronology

A more complete historical chronology is presented below. Each article is presented in a chronological order, by year, with a brief synopsis of the publication, and nomenclatural notes. Those articles marked (\*) are expanded upon in the "General History" section previously discussed, and the reader is referred to its coverage. Those articles marked (R) are expanded upon in the next chapter, "Prior Research on Clitoria," and the reader is referred to that chapter for details.

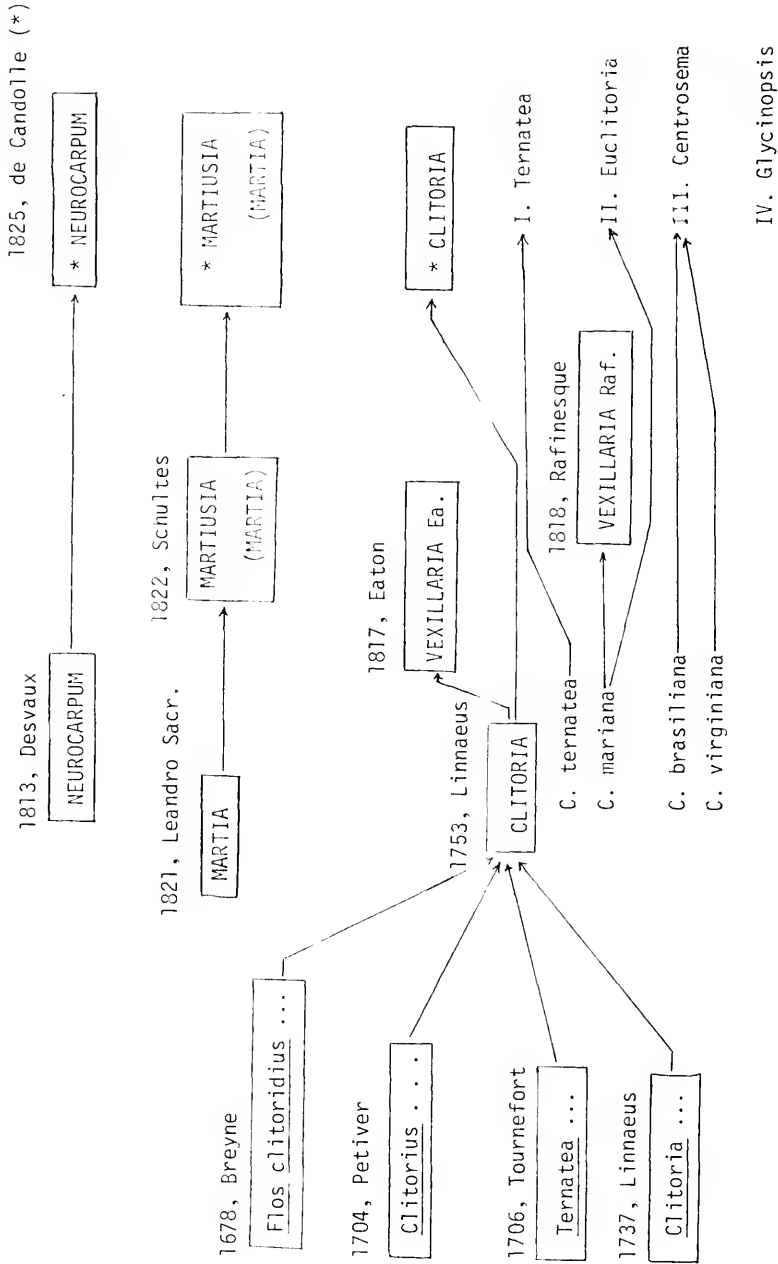


Figure 1. The history of Clitoria, pre-de Candolle.

# REVISIONARY TREATMENTS (1825-1900)

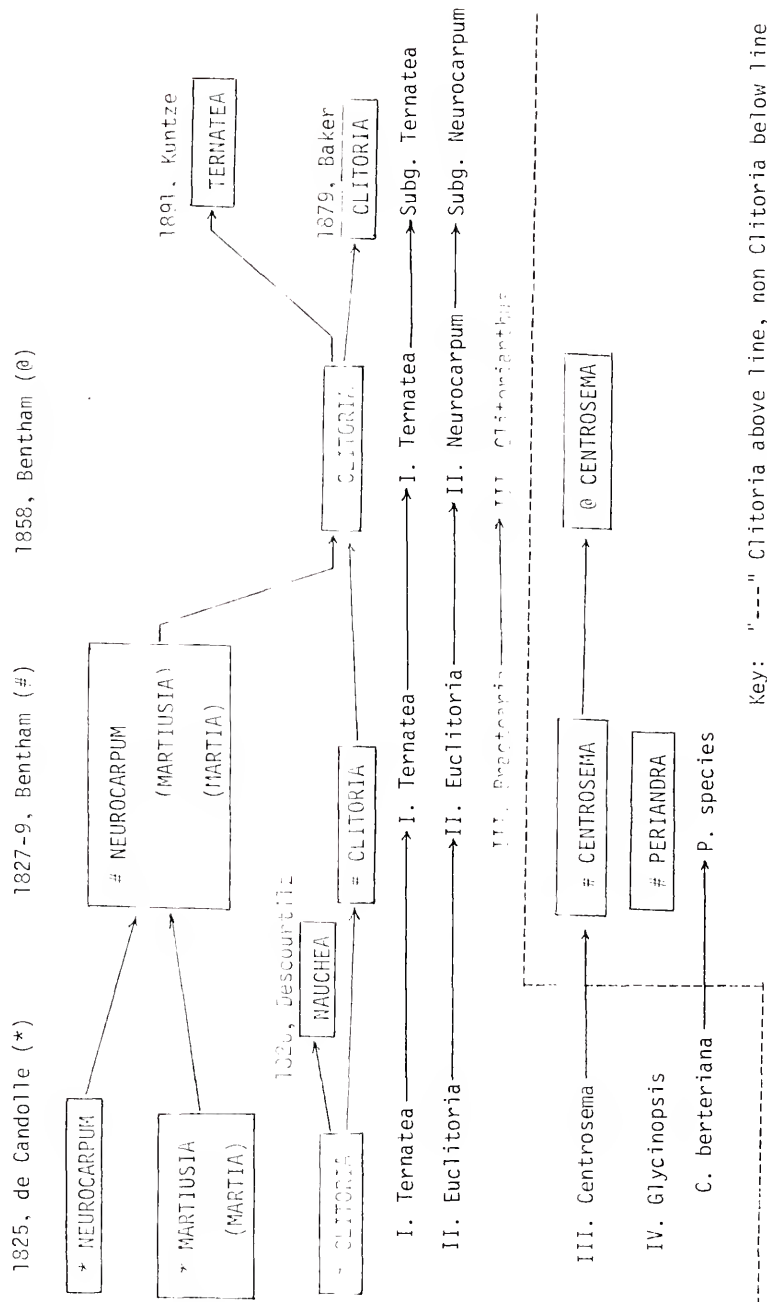


Figure 2. The history of Clitoria, post-de Candolle.

Pre-Linnean (1650-1753: Polynominal Period)

1667: Sevenhuysen was reported by Breyné (1678) to have collected a specimen from Santo Domingo that was related to the Moluccan specimen Flos clitoridis ternatensis. If this specimen is verified as a Clitoria, this would be the earliest known record of the genus.

1678: Breyné (\*) described and illustrated two specimens that are the framework upon which Linnaeus established two of the original four species of Clitoria. His Table 31 described Flos clitoridis ternatensis (= Clitoria ternatea L.) from the island of Ternate, Moluccan Islands. His Table 32 described Planta leguminosae Brasiliana, phaseoli facie, flore purpureo maximo (= Clitoria brasiliana L.).

1688: Rheede tot Draakestein described Schonga cuspi from Malabar (=S.W. India) which Linnaeus later cited in synonymy for Clitoria ternatea. From its description and a photograph of Schongi cuspi as illustrated in his Table 38, one can easily conclude that this plant is not a Clitoria specimen.

1691: Plukenet published Foenum graecum phaseoloides Virginianus flore amplo caeruleo which is the origin of the third original Linnaean species, Clitoria virginiana L.

1693: Plumier described Phaseolus ample flore peltato, siliquis nigris et angulosis (= Clitoria plumieri Turp.) based upon a specimen from Santo Domingo.

1696: In his catalogue of Jamaican plants, Sloane included Phaseolus minor lactescens flore purpureo (= Clitoria galactia Crantz).

1698: Dr. David Kreig brought a specimen to Great Britain that was collected in Maryland. This specimen is now deposited in the Royal

Botanic Garden Herbarium at Edinburgh (E-127, Herb. Dubois!). This specimen represents the oldest known representative of the genus Clitoria (= C. mariana L.).

1700: Plukenet published Phaseolus Indicus, coeruleus, Glycyrrhizae foliis alatis, flore amplo Cliterio (= Clitoria ternatea L.) and Phaseolus flore vexillo, silique rectis teretibus (= Clitoria brasiliiana L.).

1701: Commelin described and illustrated in his Table 24, Phaseolus Indicus, glycyrrhizae foliis, flore amplo, caeruleo, pleno. This was the first known example of the unique double flower of Clitoria ternatea L.

1703: Dr. Edward Bulkley sent a specimen to Great Britain that was collected from Fort St. George in the East Indies. This specimen is now deposited in the Royal Botanic Garden Herbarium at Edinburgh (E-69, Herb. Dubois!). This specimen represents the oldest known specimen of the type species of the genus Clitoria (= C. ternatea L.).

1704: Petiver (\*) published two polynomials in an appendix, the first to use "Clitorius" as the leading key term of the polynomial. His number 54 was Clitorius Marianus trifoliatus viridis which disappeared from Clitoria literature. His number 55 was Clitorius Marianus trifoliatus subtus glaucus which was the origin of the fourth original Linnaean species, Clitoria mariana L.

1706: Tournefort (\*) established the genus Ternatea based upon a specimen from Ternate, a Moluccan Island. Three elements were published which later served as the framework for the three varieties of Clitoria ternatea L. These were Ternatea flore simplici, caeruleo

(agreed with Breyne, 1678); Ternatea flore pleno, caeruleo (agreed with Commelin, 1701); and Ternatea flore simplici albedo.

1709: Petiver published Plukenet's name (1691) and illustrated a specimen in his Table 104, Figure 19.

1732: Dillenius (\*) described and illustrated Clitorius trifolius flore minore caeruleo (= Clitoria virginiana L.) which he concluded was segregated from, yet related to the specimens of Breyne (1678) and Petiver (1704). No reference was made to Plukenet (1691).

1737: Burmann reported Flos clitorius flore coeruleo (= Clitoria ternatea L.) from Ceylon (=Sri Lanka presently) citing Breyne (1678) and Plukenet (1700).

1737: Linnaeus (\*) established the genus Clitoria and recognized two species. The first species was Clitoria foliis pinnatis (= Clitoria ternatea L.) based upon Breyne (1678), Rheede tot Draakestein (1688), Plukenet (1700), Commelin (1701), Tournefort (1706), and Burmann (1737). Three "varieties" were recognized using Tournefort's segregation. The second species was Clitoria foliis ternatis (= Clitoria brasiliana L.) based upon Breyne (1678) and Phaseolus flore vexillo amplitismo, filiquis rectis teretibus published by Plumier in "Spec. 8."<sup>6</sup>

1739: Gronovius published Clitoria foliis ternatis, calycibus oblongus, from Virginia (=U.S.A.), citing Petiver (1704) number 55 in synonymy. He provided the first record of a specimen citation for Clitoria, Clayton 108 (= Clitoria mariana L.). He also reported Clitoria foliis ternatis, calycibus campanulatis, based upon Dillenius (1732), and Clayton 112 (= Clitoria virginiana L.).

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6. This author was unable to establish the publication title and therefore was unable to obtain a copy of Plumier's publication.



1740: Royen reported three species from Batavia (=Java). The first species was Clitoria foliis pinnatis of Linnaeus (1737). The second species was Clitoria foliis pinnatis, caule decumbente (=non-Clitoria). The third species was Clitoria foliis ternatis of Linnaeus (1737).

1747: Rumpf (Rumphius) described "Bongu Biru" from the island of Amboin, a Moluccan Island, as Flos coeruleus (= Clitoria ternatea L.). Vernacular names in several languages were noted.

1748: Linnaeus (\*) established binominals for his two species published in 1737. The two species became Clitoria ternatea and Clitoria brasiliana, respectively.

#### Post-Linnaean (1753-1824: Descriptive Period

1753: Linnaeus (\*) officially established the genus Clitoria, and recognized four species, Clitoria ternatea and Clitoria brasiliana based upon his prior works (1737; 1748), Clitoria virginiana based upon Dillenius and Gronovius, and Clitoria mariana based upon specimen number 55, Petiver (1704). India, Brazil, Virginia, and northern America were given as the ranges of the four species.

1754: Linnaeus (\*) published a description of the genus Clitoria. This description is the first description published that is officially recognized by present botanists through the rules established in the International Code of Botanical Nomenclature (Stafleu, 1972).

1754: Miller (\*) in his fourth edition of "Gardner's Dictionary" followed Tournefort (1706) in the treatment of the genus Ternatea. Thus the genus Ternatea Tourn. ex Miller became officially established. In the seventh edition (1759) Miller adopted the Linnaean treatment. This

was the first encyclopedia type of reference work on the genus.

Descriptions and horticultural notes were provided.

1756: Browne reported two species from Jamaica with Linnaean polynomials cited in synonymy. They were Clitoria major scandens, foliis subrotundo-ovatis, floribus geminatis (= Clitoria virginiana L.) and Clitoria minor scandens, foliis subvillosus oblongo-ovatis, floribus geminatis (= Clitoria ternatea). His Table 32 bore the title "Clitoria galactia"; however, the plant was described under the genus Galactia in the text, with Sloane's Phaseolus minor lactescens cited in synonymy. From the illustration and description, this plant is not a Clitoria.

1758: Linnaeus in his tenth edition of "Systema Naturae" cited two additional species in addition to those established in 1753. Neither were numbered as the other species were numbered. Clitoria lactescens disappeared from Clitoria literature after this date, except for Richter (1840), who cited the species in synonymy for Clitoria galactia L. The second species, Clitoria zoophthalmum, also disappeared from the literature until cited by Richter as synonymous with the non-Clitorian species, Dolichos urens L.

1762: Gronovius published the same two polynomials in the second edition of his Virginia Flora as he did in 1739. A third non-Clitorian species published in 1739 (Clitoria foliis pinnatis, caule decumbente) was now transferred to the genus Cracca.

1763: Linnaeus described a new species, Clitoria galactia, based upon Sloane's specimen cited by Browne (1756). No reference was made to Clitoria lactescens.

1766: Crantz followed Linnaeus in his treatment of Clitoria. He listed the five species in Linnaeus "Species Plantarum" (1763), but altered the spelling on two species, published as C. ternatensium and C. galactea.

1775: Aublet described a new species, Crotalaria guianensis, from French Guiana. He was the first to use bracteole and stipule characteristics, and the first to note the prominent costa on the fruit, a characteristic that was important in the segregation of genera and sections by later botanists. Aublet had collected several plants from French Guiana, which included two species similar in gross appearance that seemingly matched the illustration provided in his Plate 305. Thus, from the misidentification, the name Crotalaria guianensis Aubl. would become associated with two distinct species (i.e. Clitoria guianensis (Aubl.) Benth. and Clitoria laurifolia Poir.) and provide confusion in later literature and specimen identification.

1775: Buchoz (\*) followed the Linnaean treatment and provided the first detailed generic description of Clitoria, which included perianth, stamens, pistil, legume, and seeds. Each species was described and notes on origin, culture, and economic properties were included.

1775: Forskål (or Forsskål) described a new species, Lathyrus spectabilis (= Clitoria ternatea L.) from Egypt. He was the first to indicate the villous style typical of the genus.

1786: Lamarck (\*) described two new species of Clitoria, C. heterophylla and C. falcata, along with the basic five Linnaean species. He also described Crotalaria longifolia citing Aublet's Crotalaria guianensis in synonymy. Thus, Lamarck's name is superfluous for Aublet's name.

1786: Scopoli described Clitoria micrantha and segregated Royen's C. brasiliana from the species and called it Clitoria quadralupensis. Both species plus C. galactia L. were described with detailed descriptions and illustrated.

1788: Swartz described ?Clitoria multiflora with a two-line Latin diagnosis based upon a plant from Santo Domingo.

1788: Walter's Carolina flora recognized two species, C. mariana L. and C. virginiana L., segregated on leaflet number and calyx type.

1789: Browne republished his treatment of Clitoria originally published in 1756, still not adopting the Linnaean treatment. His Table 32, Figure 2 continued to bear the title "Clitoria galactia" while described under the genus Galactia.

1791: Gaertner, in his publication on fruits and seeds of various plants, described and illustrated those of C. ternatea L.

1792: Richard described Clitoria capitata with characteristics that are too vague for placement of the species without the specimen in hand. No type was given.

1796: Salisbury published Clitoria spectabilis which was based upon Lathyrus spectabilis Forssk. and C. ternatea L. Salisbury's name was superfluous for the Linnaean species.

1797: Raeuschel published Clitoria aquilupensis, a nomen nudum, in his list of Clitoria species.

1798: Roth described Clitoria amoena with a very detailed Latin description (clearly marking it as a Centrosema member). It was published in Röemer's "Archiv für die Botanik" and republished by Roth in his "Catalecta Botanica" in 1800.

1802: Cavanielles described a new species, Clitoria speciosa.

1804: Desfontaine in his "Tableau de l'ecole de Botanique" listed Clitoria glabella and Clitoria galactia glabella as Clitoria glabre. Both C. glabella Desf. and C. glabre Desf. were without any description or discussion and thus, nomen nudum.

1806: Salisbury described and illustrated Clitoria calcarigera. Three varieties were described based upon leaflet shape. Variety alpha was the typical representative. Variety beta was based upon Dillenius (1732). Variety gamma was based upon Clitoria virginiana L. Thus Salisbury's name was superfluous for the Linnaean name, C. virginiana.

1807: Persoon included ten species of Clitoria in his treatment of the genus. Each species had a Latin diagnosis with habitat. Two species from Domingo were newly described. Clitoria plumieri Turp. was based upon a specimen sent to him by Turpin bearing a Latin diagnosis under the name. The species was named for Plumier who described the species in 1693. The second new species was Clitoria rubiginosa Juss. ex Pers. often cited as C. rubiginosa Pers.

1811: Poiret in a supplement to Lamarck's "Encyclopédie Méthodique Botanique" added seven species to those listed by Lamarck, the last one, C. capitata Rich., lacking a number. Newly described were Clitoria polyphylla and Clitoria laurifolia from Porto Rico and Clitoria bracteata of unknown origin. The other three species included the new pair described in Persoon plus Swartz' species. Clitoria amoena Roth was synonymized with C. brasiliana. Clitoria galactia was reported as the type for a new genus Galactia Brown which was adopted by Michaux.

1812: Curtis illustrated C. ternatea in color in his "Botanical Magazine" in plate 1542.

1813: Balbis listed three species of Clitoria in his "Catalogus Stirpium." Clitoria broussonetii, named for the French botanist who sent the specimen to Balbis under a name loti coerulei, was newly described in a footnote. The footnote contained a Latin diagnosis and placement of the species near C. galactia.

1813: Desvaux (\*) described the genus Neurocarpum and indicated that it included Aublet's Crotalaria gajanensis (published as C. guianensis by Aublet) and a new species, N. ellipticum, which lacked a description and is a nomen nudum.

1814: Desvaux (\*) described Neurocarpum ellipticum and included Crotalaria guyanensis Aubl. (Aublet published as: guianensis) and Crotalaria longifolia Lam. as synonyms of Neurocarpum janensis Desv.

1814: Roxburgh listed five species of Clitoria cultivated in Calcutta. Clitoria erecta, a new species, lacked a description and thus was a nomen nudum.

1814: Brown described a new species, Clitoria arborescens, in Aiton's "Hortus Kewensis," based upon a cultivar from Trinidad. This species is usually cited as C. arborescens Ait.

1817: Eaton (\*) substituted the name Vexillaria for Clitoria because of the criticism regarding the alleged resemblance of the Clitoria flower to the female reproductive anatomy. Eaton's superfluous name was not adopted by botanists.

1818: Edwards illustrated and described in detail Clitoria plumieri Turp., with notes presented on the history of the species.

1818: Rafinesque (\*) established the genus Vexillaria Raf. by his published note "Clitoria mariana must form a particular genus

Vexillaria." Neither the generic name nor V. mariana (L.) Raf. were adopted by botanists.

1820: Curtis published a color plate and notes on Clitoria heterophylla Lam. (Plate 2111).

1821: Schrader described Clitoria coccinea, and noted it near, yet distinct from Clitoria falcata Lam.

1821: Nees included a note that Clitoria coccinea Schrad. was near his species, but uncertain where Clitoria falcata Lam. belonged. This was the source of Clitoria falcata Nees, a name associated with C. coccinea Schrad. in synonymy in later literature, but the name was not validly published. Hence, C. falcata Nees is an illegitimate name.

1821: Trattinnick cited fourteen species in his discussion of the genus Clitoria, and described and illustrated two cultivars, C. ternatea and C. brasiliana.

1821: Leandro do Sacramento (\*) described a new genus Martia based upon a cleistogamous specimen from Brazil. The genus was named in honor of the German botanist Carl Martius. One species, Martia physodes, was placed in the genus. Martia is a homonym of Martia Spreng. (1818).

1822: Schultes (\*) published Leandro do Sacramento's species under the name Martusia physalodes. The change in generic name is presumed to be due to the recognition of Martia as a homonym. The change in the spelling of "physodes" is unclear.

1824: Kunth described in detail and illustrated two new species of Neurocarpum, N. simplicifolium (plate LIX) and N. angustifolium (plate LX). Both species were from Brazil.

1824: Humboldt, Bonpland and Kunth (\*) described four species, two of which were published three months earlier by Kunth. The other two were newly described in detail. They were N. javitense from Javitan (=Yavita, Amazonas, Venezuela) and N. macrophyllum from Novo-Granata (=Columbia). A new genus Rhombolobium Rich. based upon Richard's manuscript was cited in synonymy. The genus Ternatea Tourn. was recognized as separate and included T. vulgaris, a new name for the Linnaean C. ternatea. Under a third genus, Clitoria, two new species, C. angustifolia and C. formosa, were described from Brazil.

1824: Nees and Martius described two new species from Brazil, Clitoria vicoides and Clitoria angustifolia. A Latin diagnosis was given for Clitoria tomentosa which was observed as differing from C. rubiginosa Pers.

1824: Schrank described Clitoria gladiata, a new species from Brazil.

#### Post-Linnaean (1825-1858: Revisionary Period)

1825: Hamilton miscited the genus Neurocarpum Desv. as "Neurocarpon." He split Desvaux's species (1814) such that N. ellipticum was based upon a specimen in Desvaux Herb. and N. guianensis included Crotalaria guianensis Aubl. and (rotalaria longifolia Lam. He noted the relationship to Clitoria laurifolia Poir. and C. rubiginosa Pers., both bearing the prominent lateral nerve on the legume.

1825: Velloso described and illustrated four new species, Clitoria flumensis (plate 128), Clitoria brasiliana (plate 129), Clitoria gemina (plate 130) and Clitoria insulana (plate 131).



1825: A. P. de Candolle (\*) published in mid November the first major revision of the genus Clitoria in his "Prodromous." The genus was divided into four sections. Section I (Ternatea Kunth) included two species. Section II (Euclitoria) included six species, C. glycinoides and C. poitaei newly described. Section III (Centrosema) included three species. Section IV (Glycinopsis) included only the newly described C. berteriana. In discussion of C. glycinoides de Candolle referred to Poiteau's Pilanthus. This was an earlier record of Pilanthus Poit. ex Endl. (Genera Plantarum 1289, 1841). The genera Martusia (one species) and Neurocarpum (seven species) were treated as separate genera. This publication is the source for N. falcatum DC. which was an error in citation by later botanists. Lamarck's species was transferred by de Candolle from Clitoria and should have been cited as N. falcatum (Lam.) DC.

1826: A. P. de Candolle (\*) published his "Mémoires sur la Famille des Légumineuses" nearly simultaneously (early February) with his "Prodromous," in which he explained his reasons for the classification used in his "Prodromous." This was the source cited for the origin of C. berteriana; however, the "Prodromous" predated this work by almost three months.

1826: Desvaux (\*) proposed a new group within Neurocarpum that would bear Poiteau's name Pilanthum. This section included two transfers cited as N. glycinoides N. (C. glycinoides DC.) and N. rubiginosum Desv. (C. rubiginosa Pers.) plus newly described N. villosum N. Two species were placed near Desvaux' species described in 1813, N. laurifolium Desv. (C. laurifolia Poir.) and N. barbatum N., newly described. Two species of Clitoria were newly described, C. laurifolia Nees, a homonym of Poiret (1811), and C. sinuata Nees.

1826: Descourtilz (\*) substituted the superfluous name Nauchea for Clitoria and listed thirteen species, one newly described as N. pudica.

1827: Tussax described and illustrated Turpin's C. plumieri from the West Indies.

1828: Wallich listed four species in his catalogue. Three were new species which lacked descriptions, but had specimens cited for each. They included Clitoria macrophylla Wall. (no. 5345), Clitoria acuminata Grah. (no. 5346) and Clitoria pilosula Wall. (no. 5347), each a nomen nudum.

1829: Descourtilz described the genus Nauchea, and illustrated and described three species, N. pudica, N. virginiana and N. rubiginosa, each with medicinal notes.

1830: Sweet listed twelve species in his catalogue with Clitoria occidentalis listed as a substitute for the non-Linnaean "virginiana B.R. 1047." The species is not described and the citation is unclear.

1830: Guillenim and Perrottel in their "Flora Senegambiae Tentamen" describe a new species, Clitoria micrantha, a homonym of Scopoli (1786).

1832: Curtis illustrated C. arborescens. This illustration was a composite of two species, C. arborescens and C. javitensis which resulted from additions made to an unpublished drawing of 1822.

1832: Presl described and illustrated Neurocarpum cajanifolium.

1832: Geel described and illustrated the "Plumier Clitoria."

1832: Zuccarini described Martia mexicana in detail.

1832: Don (\*) adopted de Candolle's treatment of Clitoria, Martiusia and Neurocarpum. He described Clitoria racemosa and Clitoria

alba and placed them in Sect. Euclitoria. Four of the five dubious species listed by de Candolle were placed. Clitoria broussonetii was transferred to the genus Cologania. Clitoria phyrne Juss., C. mariana Moc. and Sesse ined., C. angustifolia Nees and Mart. and C. rubiginosa Nees and Mart. were synonymized with Galactia species.

1835: Pritzel listed Nauchea clypeata Desc. based upon "Desc. Ant. 8,591," a publication not obtained by this author.

1837: Hooker described and illustrated Clitoria viridiflora Bouton ex Hook.

1837: Bojer described Clitoria lasciva and reported Clitoria viridiflora Bouton mss. Both Hooker and Bojer cite "Bouton mss. in hb. nostr." Stafleu's "Taxonomic Literature" (no. 537) indicated Hooker published sometime within October 7 to November 8. The date of Bojer's publication was unknown except for the year, although if it preceded Hooker, then C. viridiflora Boj. was a nomen nudum. Bojer made no reference to Hooker.

1837: Schlechtendal reported Clitoria mariana L. from Mexico. This was the source of Clitoria mariana Schlecht. cited by other botanists. Schlechtendal had misidentified his specimens, which are Clitoria mexicana Link.

1837: Bentham (\*) published a revision of de Candolle's treatment of Clitoria, Neurocarpum and Martiusia. Two sections of Clitoria were eliminated. Section Centrosema was elevated to a genus level. Section Glycinopsis was eliminated through the transfer of its only species to another genus. To the remaining two de Candolle sections, Bentham added the section Bractearia. Martiusia and Martia were synonymized with Neurocarpum. Bentham noted the close relationship of Clitoria and

Neurocarpum segregated only by the prominent costa on the legume. New species included Clitoria amazonum Mart. ex Benth., Clitoria acuminata Benth., Clitoria arborea Benth., Clitoria racemosa Benth., Clitoria pedunculata Boj. ex Benth., Neurocarpum longifolium Mart. ex Benth., Neurocarpum frigidulum Mart. ex Benth., Neurocarpum rufescens Benth., Neurocarpum densiflorum Benth., and Neurocarpum bracteatum Mart. ex Benth.

1838: Schlechtendal described Clitoria schiedeana.

1838: Lindley reported that C. ternatea roots were emetic.

1839: Bentham's 1837 article was republished with the title revised.

1839: Bentham reported on Schomburgk's British Guiana collections and substituted the name Dendrocyamus for his section Bractearia. He reasoned that the name Bractearia was preoccupied by a genus in the Rubiaceae and in a section of Chaetogastra, and thus inappropriate for Clitoria.

1839: Bentham described Clitoria polystachya in his enumeration of Hartweg collections.

1840: Bentham described Neurocarpum flagellare and synonymized N. frigidulum with N. longifolium in Hooker's "Journal of Botany."

1840: Steudel published a list of Clitoria species and species transferred. The following binomials, each a nomen nudum, appeared for the first time: C. brasiliana Arrab., C. grahami Steud. (C. acuminata Grah.), C. insulana Arrab., C. micrantha Smith, C. phryne Commers. and C. pudica Steud. (Nauclea pudica Desc.). The latter name was a transferred name and legitimate. Clitoria grahami was an apparent

substitute name for the homonym C. acuminata Grah. which to this date was still undescribed.

1841: Steudel's second volume published two new binominals for Neurocarpum, each a nomen nudum. They included Martia brasiliensis Zuccar. (N. ellipticum Desv.) and N. mexicanum Steud. (Martia mexicana Zuccar.), both transferred to Neurocarpum, the latter described previously, the former undescribed but placed in synonymy.

1841: Hooker and Arnott described Neurocarpum multiflorum in their enumeration of the plants collected on the Beechey's voyage.

1841: Brunbury described Neurocarpum resupinatum from Brazil.

1842: Hasskarl described two new species from Java, Clitoria oblonga (C. virginiana L. var elliptica DC.) and Neurocarpus retusus.

1842: Bertoloni described and illustrated Clitoria alabamensis.

1843: Martius and Galeotti described Clitoria multiflora and Clitoria grandiflora from Mexico.

1844: Benthham described Clitoria brachystegia from Ecuador in his enumeration of plants collected on the voyage of the Sulphur.

1844: Hasskarl published Neurocarpus, an orthographic variant of Neurocarpum, and Neurocarpus retusus.

1844: Paxton illustrated in color and described Clitoria fulgens (Centrosema coccinea).

1845: Voigt transferred Clitoria erecta Roxb. to Neurocarpum. He listed six species of Clitoria cultivated in Calcutta.

1845: Blanco reported one species, C. ternatea, from the Philippines.

1845: Tenore described Clitoria tristis.

1847: Burnett illustrated and described a new variety, C. ternatea var. major, based upon a cultivar raised from seeds sent from New South Wales. He also illustrated and discussed Paxton's species.

1848: Hasskarl provided a detailed description of his species, Neurocarpus retusus, published in 1844.

1848: Schomburgk published three new species and a new genus based upon a manuscript of Klotzsch. Each was a nomen nudum. The genus was Macrotrullion Kl. with two species, M. spendens Kl. and M. elegans Kl. The third species was Neurocarpum speciosum Kl.

1850: Dalzell described Clitoria biflora, a new species, from India.

1851: Miquel described Clitoria amoena, a new species from the lower Marrowyne River.

1852: Bentham described two species in a footnote that were published previously as a nomen nudum. They were Clitoria macrophylla Wall. (published 1828) and Clitoria grahami Steud. (published in 1852; synonym C. acuminata Wall. published in 1828.)

1853: Duchass and Walpers describe Neurocarpum argentum, a new species from Panama.

1854: Beurling published Clitoria portobellensis, a new species from Panama.

1856: Miquel described a new species from Java, Clitoria javanica.

1858: Bentham (\*) published his second revision of the genus Clitoria which included Ternatea, Neurocarpum, Martia and Martiusia in synonymy. The major change was the synonymizing of the latter three genera with Clitoria. Bentham noted that the character of the legume costa broke down. Another change was the name Clitoriathus used for

section three instead of Bentham's earlier names Bractearia (1837) or Dendrocyamus (1839). New species described were C. flagellaris, C. rufescens, C. nana, C. selloi, C. leptostachya; C. hoffmanseggii (superfluous name for C. arborea) and C. stipularis. The species transferred from Neurocarpum included C. simplicifolia, C. guianensis and C. densiflora.

Post-Linnaean (1859-1932): Floristic Period)

1862: Bentham in Martius and Eichler's "Flora Brasiliensis" listed fifteen species with descriptions, synonymy, and a key to the species. This was the first record of a key to Clitoria species and used characters of: habit; leaflet shape, pubescence and number; legume costa; peduncle length and number of flowers borne; and bracteole shape and length relative to calyx or pedicel. New binominals included C. guyanensis (orthographic variant of C. guianensis) and C. cajanifolia (transfer of species from Neurocarpum). A new variety described was C. glycinoides var. aurantiaca.

1864: Griesbach reported four species of Clitoria in his flora of the British West Indies.

1864: Bentham described a new species in his "Flora Australiensis," Clitoria australis.

1866: Griesbach described a new species in his "Catalogus Plantarum Cubensium," Clitoria glomerata.

1871: Oliver reported one species from tropical West Africa in his flora.

1875: Micheli described a new species from Brazil, Clitoria pedunculata. This name was a homonym for Bojer ex Benth. (1837). Micheli placed his species in Section Clitorianthes.

1878: Lowis provided some observations on the Indian C. ternatea.

1878: Hance reported on rare Chinese plants and listed Clitoria macrophylla Wall. for a specimen in his herbarium collected by Sampson. This was the source for C. macrophylla Hance cited by later botanists.

1878: In a second Philippine flora, Blanco continued to report one species of Clitoria as he had in 1845.

1878: Vatke described Clitoria zanzibarensis, a new species from East Africa.

1879: Baker (\*) reported five species of Clitoria in his flora of British India. He made a revisionary change that elevated Ternatea and Neurocarpum to the subgenus level, the first botanist to do so. Section Clitorianthes was not reported, presumably because the species within this group did not occur in India. A new variety was reported, C. ternatea var. pilosula (C. pilosula Wall.).

1882: Sagot reported five species of Clitoria in his French Guiana flora. A new variety, C. javitensis var. glabra, was described.

1887: Watson described two new species from Mexico. Clitoria triflora was placed near C. guianensis in the section Neurocarpum. Clitoria sericea was described from a fruiting specimen. Watson did not place this species in any section.

1887: Hemsley described Clitoria Hanceana based upon a specimen in Hance's herbarium collected by Sampson. He noted that this was equivalent to C. macrophylla Hance (cf 1878), but not C. macrophylla Wall.

1887: Sessé and Mocino described two new species from Mexico. Clitoria racemosa (homonym of Don, 1832, and Benthams, 1837) was first reported in synonymy by Don (1832) and probably by de Candolle (1825)



as a synonym of C. plumieri based upon a manuscript of Mocino and Sessé cited as "fl. Mex. ic. ined." The second species, Clitoria uirginiana, was probably an orthographic error (cf. 1893) because Gronovius' "Flora Virginiana" was cited (also typographic error with "U" for "V" and corrected by Sessé and Mocino in the second edition of their publication.

1889: Deflers reported one species from Yemen.

1893: Sessé and Mocino published their second edition of "Plantae Novae Hispaniae" and cited C. virginiana. This corrected the orthographic error of their first edition (cf. 1887).

1891: Kuntze (\*) transferred twenty-nine species to the genus Ternatea because Clitoria was a homonym of Clitorius Dillenius (1732).

1894: Taubert in Engler and Prantl's "Die natürlichen Pflanzen Familien" adopted Bentham's treatment. They indicated about thirty species in the genus were found in the tropical zone, but their species were reported by sections and totaled to only twenty-four. They placed ca. six species in Section Ternatea (Asia and Africa), ca. fifteen species in Section Neurocarpum (Asia, Australia, and America), and ca. three species in Section Clitorianthes (tropical America).

1894: Nairne reported one species of Clitoria in his Western India flora.

1894: Robinson described the flowers of C. sericea (cf. Watson, 1887) and noted that the style was similar to Centrosema, yet had other flower characters of Clitoria.

1894: Sessé and Mocino's "Flora Mexicana" followed their 1893 treatment of Mexican plants.

1894: Siebert and Voss reported Clitoria coelestis as a horticultural synonym of C. ternatea. This new binomial is a nomen nudum.

1897: Britton and Brown reported one species of Clitoria in their flora of the northern United States.

1897: Duss reported two species from Martinique that occur natively plus one cultivated species. A new variety, C. glycinoides var. ecostata, was a nomen nudum.

1897: Micheli described a new species from East Africa, Clitoria tanganicensis.

1899: Rose reported nine species of Clitoria in Mexico with six additional species as doubtful and excluded. Two new species were Clitoria humilis and Clitoria subsessilis. Rose indicated that Clitoria sericea may be a Cracca and that Clitoria grandiflora Mart. & Gal. and Clitoria schiedeana suggested Centrosema.

1900: Bailey reported two Australian species of Clitoria in his Queensland flora.

1901: Huber described a new species from Brazil, Clitoria cearensis and noted its affinities with C. glycinoides, C. guyanensis and C. cajanifolia.

1903: Merrill reported vernacular names of C. ternatea in his Philippine Dictionary.

1904: Chodat and Hassler described a new variety from Brazil, Clitoria cajanifolia var. latifolia.

1907: Harms reported the first occurrence of cleistogamy in Clitoria in a detailed article. Cleistogamous flowers in three species were described and illustrated. They were C. glycinoides, C. guianensis and C. cajanifolia. Harms discussed the history of Martia

physodes, a species described based upon a cleistogamous flowered specimen from Brazil (cf. 1821).

1908: Mattei described a new species from northern Africa, Clitoria albiflora. He noted its affinities to C. ternatea and C. tanganicensis.

1909: Bailey listed the same two species of Clitoria in his Queensland catalogue that he reported in his flora (1900).

1909: Gibbs reported one species of Clitoria in his Fiji flora.

1909: Herzog described a new species from Bolivia, Clitoria nervosa. He noted its affinities to C. hoffmanseggii and C. racemosa Benth.

1909: Huber described a new species from Brazil, Clitoria obidensis.

1910: Hassler described a new variety of Clitoria from Paraguay, C. densiflora Benth. var. micronata.

1911: Dunn added C. mariana to the list of species found in China.

1911: Hayata reported one species of Clitoria from Formosa.

1912: Merrill reported one species of Clitoria from Manila in his flora.

1912: Compton (R) described the seedling morphology and vascular structure of C. ternatea. This was the first non-floristic, non-nomenclatural, non-horticultural research undertaken on the genus Clitoria.

1913: Harms described a new species of Clitoria from the Congo, Clitoria kaessneri.

1914: Baevecke reported one species of Clitoria from the Eastern United States in his flora.

1915: Gagnepain described a new species from Laos, Clitoria linearis, and placed it near C. hanceana.

1916: LeCompte reported six species of Clitoria from Indo-China. A key, descriptions, distributions, and citations were included. Clitoria linearis was illustrated. A new variety was described, C. hanceana Hemsl. var. laureola.

1917: Ewart reported one species of Clitoria in his Australian flora on the Northern Territory.

1918: Britton reported one species of Clitoria from Bermuda in his flora.

1918: Kirtikar and Basu reported the Indian vernacular names and medicinal properties of C. ternatea.

1918: Pittier described and illustrated the keel and wings of a new Venezuelan species, Clitoria dendrina.

1919: Brandegee described a new species from Baja California, Clitoria monticola, and segregated it from C. mariana.

1920: Britton reported one species of Clitoria from the Bahamas in his flora.

1920: Fawcett reported two species of Clitoria from Jamaica in his flora. They were segregated by leaflet number and flower color.

1921: Harms described a new species from Brazil, Clitoria brachycalyx and reported its affinities with C. brachystegia.

1922: Ducke described a new species from Brazil, Clitoria snethlageae, and noted its affinities with C. leptostachya.

1922: Ridley reported two species of Clitoria from the Malayan Peninsula in his flora and noted that C. cajanifolia was introduced into Indonesia on Brazilian cattle which had the viscid seeds in their hair.

1922: Standley reported six species of Clitorian trees and shrubs from Mexico in his flora. A key and brief diagnosis were included.

1923: Merrill reported one species of Clitoria from the Philippines in his flora.

1924: Britton reported three species from Puerto Rico and the Virgin Islands in the survey conducted by the New York Academy of Science. One species was reported under the genus Clitoria. Two species from the Neurocarpum section were reported under the genus Martiusia. Even though the original species N. ellipticum Desv. was listed in synonymy, Britton did not use the older generic name Neurocarpum. The two transferred species were Martiusia rubiginosa (Juss.) Britton and Martiusia laurifolia (Poir.) Britton. This was the first example of a botanist diverting from Bentham's treatment of 1858. This trend of recognizing two genera, Clitoria and Martiusia, was followed by a few American botanists.

1925: Fragoso and Ciferri (R) described several ascomycete species from branches and legumes of "siccis Clitoriae triandrae" collected in the Dominican Republic. This was the source for two names, Clitoria triandra and Clitoria riandra.

1925: De Wild described a new species from British East Africa, Clitoria mearnsi.

1926: Small described a new species from Florida, Clitoria fragrans and noted its affinities with C. mariana.

1928: Standley reported four species of Clitoria from the Panama Canal Zone in his flora. A key and habitats were included.

1929: Baker reported four species of Clitoria in his treatment of Tropical Africa legumes. A key and diagnosis were included. He noted that C. albiflora and C. mearnsi were equivalent to C. ternatea. A new variety that had been nom. in sched. was described as Clitoria ternatea var. angustifolia Hochst. ex Bak. Baker published Clitoria tanganyicensis Micheli as an orthographic correction for C. tanganicensis Micheli (1897).

1929: Hutchinson & Dalziel transferred C. racemosa Don to the genus Vigna.

1929: Standley transferred C. sericea Wats. to the genus Tephrosia.

1930: Barker and Darbeau reported four species of Clitoria from Haiti which included C. plumieri Tuss., a nomen nudum.

1930: Ducke described a new species from Brazil, Clitoria grandifolia, and noted its affinities to C. arborescens.

1930: Macbride described a new species from Peru, Clitoria pozuzoensis. He noted that some of the characters that Bentham used to distinguish the species of Section Clitorianthes broke down since Macbride's new species keyed to C. javitensis from which it was totally different.

1931: Gleason reported a species of Clitoria collected on the Tyler-Duida expedition to Colombia.

1931: Malme described a new species from Brazil, Clitoria chapadensis and noted its affinities with C. guyanensis. He also described a new variety, Clitoria glycinoides var. megapotamica.

1931: Sandwith reported his observations on the type of nomenclatural problems of C. javitensis.

1931: Standley reported two species of Clitoria from the Lancetilla Valley of Honduras.

1931: Williams reported four species of Clitoria from Trinidad and Tobago. A key is included.

Post-Linnaean (1932-present: Research Period)

1932: Tschchow and Kartaschowa (R) reported the first chromosome count for the genus with  $2n=16$  for C. ternatea. The chromosomes were illustrated in a camera lucida drawing. Relationships of C. ternatea with other species in the Phaseoleae tribe were discussed.

1932: Rydberg reported one species of Clitoria in his flora of the Central North American plains and prairies.

1933: Small reported one species of Clitoria and two species of Martiusia in the Southeastern United States. His floristic study adopted Britton's treatment (1924). Small's species (1926) was transferred as Martiusia fragrans Small.

1933: Holland and Joachim (R) reported their results on soil erosion experiments with C. cajanifolia in Ceylon (=Sri Lanka).

1935: Burkill reported the economic uses of two species of Clitoria of the Malayan Peninsula.

1936: Brown reported one species of Clitoria in his flora of Southeastern Polynesia.

1936: Standley reported two species of Clitoria from British Honduras. Neither a key nor descriptions were included.

1936: Stahl included three species of Clitoria from Puerto Rico.

1937: Standley reported four species of Clitoria from Costa Rica.

1937: Stehlé reported on the colonization of some plants in Martinique and included Clitoria rubiginosa Juss. var. ecostata (Urb.) Stehlé, a nomen nudum.

1939: Amshoff reported eight species of Clitoria in Pulle's Suriname flora. A key was included. Amshoff adopted Bentham's classification (1858).

1940: Standley described a new species from Panama, Clitoria velutina.

1941: Burkart described and illustrated a new species from Argentina, Clitoria cordobensis. He discussed cleistogamous flowers in the species and its affinities with C. mariana, C. guyanensis, C. multiflora and C. rubiginosa.

1943: Kok, Machado and Meirelles (R) reported their results of utilizing C. ternatea hay for sheep digestion.

1943: Macbride reported eight species of Clitoria from Peru. A key, descriptions, and citations were included. However, this treatment was of poor quality because of the numerous misidentified specimens that Macbride examined and the difficulty within the group Clitorianthes. Macbride reported variability in several species, and along with his additional notes, indicated his awareness of the problem. Some species reported do not occur in Peru. Other species not reported do occur in Peru. Peru has several endemics not recognized by Macbride.

1943: Mocosó reported four species of Clitoria from the Dominican Republic in his flora. Clitoria polyphylla was included in synonymy with a Barbieria species.

1943: Pittier described a new species from Venezuela, Clitoria glaberrima. He noted its affinities with C. arborescens and C. dendrina.



The description included "Pedicelli 4-5 cm" which was a typographical error for "mm."

1944: Pittier published a second description of C. dendrina (cf. 1918) and illustrated the perianth.

1945: Hassell (R) reported his results of experiments to establish C. ternatea in pastures of Queensland, Australia.

1946: Standley reported five species of Clitoria in his flora of Guatemala. A key was included.

1946: Strang reported the ornamental properties of C. racemosa Benth. in Brazil.

1948: Robyns reported one species of Clitoria in his flora of Albert National Park in Africa.

1948: Stehlé and Quentin reported two species of Clitoria from Guadeloupe in their flora. They included C. rubiginosa var. genuina (illegitimate name for the typical variety) and C. rubiginosa var. ecostata (Urb.) Stehlé, a nomen nudum (cf. 1937).

1949: Burkart described and illustrated a new species from Argentina, Clitoria epetiolata. He noted its affinities and compared the species to C. guianensis. The variety C. epetiolata var. latiuscula was described.

1949: Chopra, Nath, Badhwar, and Ghosh reported the economic uses and problems of C. ternatea in their "Indigenous Drugs of India."

1949: Henderson reported C. laurifolia as an established Malayan wildflower introduced from Brazil early in the nineteenth century.

1949: Johnston reported C. portobellensis from San José Island, Gulf of Panamá, in his flora and discussed its confusion with Clitoria arborescens, the name the Panama plants were given by botanists.

1949: Merrill in his "Index Rafinesque" reported that C. parviflora Raf. was C. ternatea.

1950: Metcalfe and Chalke (R) included the genus Clitoria in their descriptive anatomy of the Papilionaceae. Leaf, axis and wood characteristics were included. The species studied were not reported.

1950: Velez and Overbech included C. ternatea as a desirable cultivar in their book.

1951: Krapovickas and Krapovickas (R) reported a chromosome count of  $2n=24$  for C. cordoboensis and discussed its relationship to C. ternatea.

1951: Leon reported three species of Clitoria from Cuba in his flora. Clitoria glomerata was included in synonymy with a Galactia species.

1951: Quisumbing reported the medicinal properties of C. ternatea in the Philippines.

1951: Rau (R) described endosperm development in C. ternatea.

1952: Andrews reported one species of Clitoria from the Sudan in his flora.

1952: Burkart reported five species of Clitoria from Argentina. A key was included.

1952: Lemee reported six species of Clitoria in his French Guiana flora.

1952: Schery described a new species, Clitoria coriacea, from Brazil.

1953: Frahm-Leliveld (R) reported a chromosome count of  $2n=16$  for C. ternatea.

1954: Berhaut reported two species of Clitoria from Senegal in his flora. Within his key he published C. ternatea var. alba.

1954: Wilce reported three species of Clitoria in his Belgian Congo flora. A key and descriptions were included. He recognized Baker's variety (1929) of C. ternatea and included C. tanganicensis and C. mearnsi as synonyms.

1955: Sirdeshmukh (R) reported a double flower occurring within C. ternatea.

1956: Bunting and Lea (R) reported their observations on the introduction of three strains of C. ternatea in Sudan pastures.

1956: Fidalgo (R) reported his anatomical study of the Brazilian tree ornamental, C. racemosa Benth. (= C. fairchildiana). This was the first and only anatomical study of a Clitoria species, except for the survey of Metcalfe and Chalk (1950). Twenty plates of illustrated anatomical structures were presented.

1956: Gardner and Bennett included C. ternatea as a poisonous plant in their book "Toxic Plants of Western Australia" and reported the curariform properties of the seeds of C. arborescens.

1957: Cowan described a new species from Venezuela, Clitoria cerifera, and noted its affinities to C. arborescens. The species was illustrated in his Figure 65.

1958: Chopra, Chopra, Honda, and Kapur included C. ternatea in their book "Indigenous Drugs of India" and reported the species' use and effects as: a cathartic, a remedy for snake bites and scorpion sting, an anti-dysenteric drug, a diuretic drug, a laxative, a drug for gonorrhea, and a skin jelly for eczema, prurigo and impetigo.

1958: Santapau reported one species of Clitoria in his flora of Purandhar, India.

1959: Rizzini described a new species from Paraguay, Clitoria burkartii.

1959: Tiwari and Gupta (R) reported the first chemical study of a Clitoria species and reported a new chemical "aparajitin" extracted from the leaves of C. ternatea.

1960: Sinha (R) identified a sterol from the yellow oil of the seeds of C. ternatea. In a second article, Sinha (R) reported a chemical and its properties extracted from the leaves of C. mariana. Although unnamed by Sinha, the author of the present study found the properties to agree with those of "aparajitin."

1961: Hundley reported two species of Clitoria from Burma and their vernacular names.

1961: Sen (R) reported and illustrated binucleate pollen mother cells in C. ternatea.

1961: Sen and Krishnan (R) reported their genetic experimental results with the double flowers of C. ternatea and concluded that the double flowers originated through a dominant gene mutation.

1961: Saroja (R) reported a chromosome count of  $n=8$  for the double flowered C. ternatea. He also reported his results on the fertility of its pollen grains with those grains of the papilionaceous flower type. Saroja concluded that the mutant gene was pleiotropic.

1962: Lind and Tallantire reported one Clitoria species from Uganda.

1962: White reported one species of Clitoria from Northern Rhodesia (=Zambia).

1963: Backer and Bakhuizen von Brink reported four species of Clitoria from Java within a detailed descriptive key. They synonymized C. javanica with C. rubiginosa.

1963: Maheshwari reported one species of Clitoria from Delhi.

1963. Rizzini reported twenty-three species of Clitoria from Brazil. His treatment included keys, descriptions, morphological notes, extensive citations, and illustrations of leaflets and some germination diagrams. He reported that for the few species studied, seed germination type was an excellent sectional character. He found that Sect. Ternatea and Sect. Clitorianthes was of the epigeal type and that Sect. Neurocarpum was of the hypogean type. Newly described were Clitoria rubiginosa f. longifolia, C. rubiginosa f. latifolia, C. guyanensis f. chapadensis (Malme) Rizz., C. amazonum f. rotundifolia and C. racemosa f. obovatifolia. Despite a few nomenclatural errors, Rizzini's floristic treatment was the best of any seen by the author of the present study.

1965: Angley reported three species of Clitoria from Paraná, Brazil without naming the species.

1965: Gooding, Loveless, and Proctor reported one species of Clitoria from Barbados.

1965: Liogier transferred two species from Martiusia in Britton and Wilson's flora (1924) to Clitoria, which corresponded to Bentham's treatment.

1966: Chavan reported two species of Clitoria from Gujarat, India.

1966: Hutchinson and Dalziel reported two species of Clitoria from West Tropical Africa.

1966: Lourtig discussed the specimens within the herbarium of Johan Burman and reported that Flos Clitorius flore coeruleo Burm was Clitoria ternatea (cf. 1737).

1966: Padmanabhan (R) reported the first tissue culture studies on a Clitorian species. His results on the excised embryonal axes of C. ternatea were discussed.

1967: Boulos reported one species of Clitoria in his weed flora of Aswan, Egypt.

1967: D'Arcy reported one species of Clitoria from the Virgin Islands.

1967: Howard reported his observations on the woody Clitoria species and substituted the name Clitoria fairchildiana for the homonym C. racemosa Benth.

1967: Mullick, Prakash and Chatterji (R) reported their results on seed germination of C. ternatea under various ecological and physiological conditions.

1967: Mullick and Chatterji reported their results of the effects of sodium cyanide on seed germination of C. ternatea.

1967: Mitra and Datta reported a chromosome count of  $n=8$  for C. ternatea.

1968: Baum discussed binominals used by Linnaeus in his "Systema Naturae, ed. 10" and reported C. lactescens was C. galactia and that C. zoophthalmum was Dolichos urens.

1968: Gupta and Lal (R) reported their isolation of a hexacosanol, a sitosterol and an anthoxanthin glucoside from the seeds of C. ternatea.

1968: Lakshmann and Padmanabhan (R) reported their results of the antibiotic ascochitine on the growth of C. ternatea in vitro.

1968: Radford reported one species of Clitoria from the Carolinas.

1968: Uphof reported the economic importance of three Clitoria species in his dictionary.

1970: Datta and Saha (R) reported the floral vasculature of C. ternatea and concluded that it represented an advance stage in the Phaseolae.

1970: Katiyar, Ranjhan and Shukla (R) reported their experimental results on the yield and nutritive of C. ternatea for sheep.

1970: Oakes (R) reported his results on C. ternatea grown for livestock consumption.

1970: Correll and Johnston reported one native species and one cultivated species of Clitoria in Texas.

1970: Verdcourt reported one species of Clitoria from Tropical East Africa and described a new variety C. rubiginosa var. glabrescens. He proposed that the following species of the "rubiginosa-mariana" complex be reduced to subspecific levels under the two species C. mariana and C. rubiginosa based upon stipule shape. His complex included C. mariana L., C. grahami Steud. ex Benth., C. javanica Miq., C. australis Benth., C. fragrans Small, C. mexicana Link and C. rubiginosa Pers.

1971: Cameron reported C. ternatea reacted favorably to a small extent in becoming established where trifluralin was used to control the black pigweed Trianthema portulacastrum.

1971: D'Orey and Liberato reported one species of Clitoria from Portugese Guinea.

1971: Gillett, Pohill and Verdcourt reported three species of Clitoria from Tropical East Africa. Clitoria ternatea was concluded

to be a polymorphic species that included C. zanzibarensis, C. mearnsii, C. tanganicensis and C. ternatea var. angustifolia, and no variety was recognized. Refer to the African members of C. ternatea in this study.

1972: Adams reported two species of Clitoria from Jamaica.

1972: Liberato reported one species of Clitoria from S. Tome and Principe.

1973: Aiyar, Narayanan, Seshadri and Vydeeswaran (R) reported three glycosides of kaempferol extracted from the leaves of C. ternatea.

1974: Croat reported six species of Clitoria in Panama, with the new combination C. guianensis var. subsessilis. Croat correctly provided the first explanation of the plants known by the name C. arborescens as represented by two species, a liana C. javitensis and the tree, C. glaberrima.

1975: Fantz sent a manuscript on Clitoria for inclusion within the Leguminosae in the Flora of Panama series, which was accepted and approved by the editor. Six species were reported and described. They represented the same six species identified by Croat, but with some changes in the species names to correct nomenclatural errors to conform with the Code. Croat's variety was not recognized as his segregating characters broke down. The publication will appear when the entire family has been treated.

1976: Fantz presented a preliminary paper comparing diagnostic characters that segregate Clitoria from Centrosema. This was in response to some individual suggestions and herbaria proposals that the two genera should be recombined, a proposal he does not agree with as the genera are distinct entities.



## PRIOR RESEARCH ON CLITORIA

Most of the prior research on Clitoria that is non-floristic and non-nomenclatural occurred after 1950. The amount of research on Clitoria has been relatively small given the size of the genus. Most of the work has involved the species Clitoria ternatea. This species is commonly cultivated in gardens and often escapes, becoming naturalized, giving it the largest distribution (panropical and subtropical) in the genus. Because of its easy accessibility, C. ternatea was usually selected as the representative of the genus Clitoria when research problems included several legume genera.

### Anatomical Research

The few anatomical studies on Clitoria have resulted from surveys including a number of genera. Only Fidalgo (1956) provided a detailed anatomical study of a species within the genus.

Metcalfe and Chalk (1950) included Clitoria as one of the genera in their descriptive anatomy of the Papilionaceae. No reference was made as to which Clitoria species were used in their study. They often described an anatomical characteristic followed by a list of genera that included species with this characteristic. The following anatomical characteristics were noted for Clitoria: Leaf: Non-glandular, hooked hairs, with short basal cells, and a larger bent, terminal cell (p. 505); lower surface papillose or subpapillose (p. 506); epidermis

often including a proportion of mucilaginous cells (p. 506); rod-shaped crystals (styloids) in the palisade tissue (p. 511). Axis: Young stem with cork arising in the middle of the cortex (p. 513); tanniniferous cells, colored brown in dried material, and sometimes containing proteins, mucilage, and other materials as well, often occurring in groups situated in the pith and phloem or in the primary cortex (p. 515). Wood: Parenchyma very abundant, in broad, moderately regular bands 4 cells or more wide in some species (p. 521); rays exclusively uniseriate or with only occasional biseriate rays in some species (p. 524); rays up to 1 mm in height in some species (p. 524); sheath cells present in some species (p. 525); fibres forming small islands on the cross-section owing to the abundance of wood and ray parenchyma (p. 525).

Datta and Saha (1970) included Clitoria ternatea as one representative member in their study of the floral vasculature of the tribe Phaseoleae. Their findings include that the common bundles for perianth, stamen and disc remained undivided for a short distance; that the disc traces are feebler, branching immediately after origin in the swellings at the bases of the stamens for a short distance; that the common bundles for the perianth and stamens are elongated; that the style is hollow having one dorsal and two marginal traces, with the upper part solid having a single trace; that the vascular trace continues almost up to the stigma tip. A camera lucida drawing of a transection of the floral axis is illustrated in Figure 1 and a graphic diagram of the floral vasculature is illustrated in Figure 17.

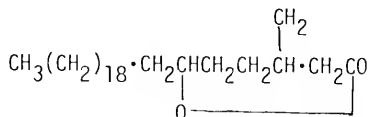
Fidalgo (1956) did an anatomical study of Clitoria fairchildiana (published under the synonym Clitoria racemosa), a tree species

cultivated in parts of Brazil as an ornamental, and infrequently cultivated elsewhere. He provided 43 pages of his techniques and descriptive anatomical results on the roots, stems, leaves, flowers, fruits, and seeds. He included 20 plates (52 figures) of drawings that illustrate the anatomical structures. He concluded that there is a great occurrence of calcium oxalate, monoclinal, principally in the cortical parenchyma; small particles of starch were found in woody parenchymous cells, in great abundance in the pith; tannins occur frequently, not from internal differentiation of cell, but from secretory pockets or canals; mucilaginous canals commonly not in parenchymatous pith rays; external epidermis provided with uniseriate protective hairs (not peduncle) with 1 or 2 basal cells, partially or totally caducous with developing organ; secretory hairs occur in hidden parts of peduncle, with a single basal cell and a terminal swelling; development of 2° structures of stem emerges between layers of apical collenchyma, strata of suberized cells occupy various positions; petioles invaginated from bark by activity of cambium and isolated woody elements forming a secondary internal woody ring of bark; pulvinus and rachis express an interesting evolution of cortical weave which permits movement of the leaves; leaves present numerous adaptations to xerophytic conditions, with great cavities in the lower epidermis, obliterated by long protective hairs over large, scanty stomata; fruit with two patterns of sclerenchymous layers orientated in different directions; seed coat formed of numerous weave patterns in the external epidermis, not containing toxic proteins, presenting great advantages for their use through cattle alimentary tracts.

### Chemical Research

Chemical research has been conducted by Indian investigators on the seeds and leaves of Clitoria species that occur natively in India and are reported by the Indians to be of medicinal value.

Tiwari and Gupta (1959) reported a new chemical they named "aparajitin" that was obtained from an alcoholic extract of the dried leaves of C. ternatea. The chemical name was derived from the plant's Indian vernacular name of "aparajita." Based on experimental results, aparajitin ( $C_{26}H_{50}O_2$ ) was determined to be a  $\sigma$ -lactone of 2-methyl-4-hydroxy-n-pentacosanoic acid with the chemical structure:



The properties of aparajitin were described as insoluble in water, cold alcohol, chloroform, ether, and petroleum ether; sparingly soluble in acetone; soluble in hot alcohol, benzene, ethyl acetate and pyridine; did not decolorize bromine water or alkaline potassium permanganate solution and gave no acetyl derivative; did not reduce Fehling's solution nor respond to any keto group test; laevo-rotatory with M.W. of 390 and m.p. of 92-93°; treatment with hydroiodic acid and hydrobromic acid produced 2-methyl-4-iodo-n-pentacosanoic acid ( $C_{26}H_{51}O_2I$ ) and methyl-4-bromo-pentacosanoic acid ( $C_{26}H_{51}O_2Br$ ) respectively; esterification produced methyl acid, 2-methyl-4-hydroxy-n-pentacosanoic acid, which formed the acetyl derivative of 2-methyl-4-hydroxymethyl-n-pentacosanoate; oxidation produced arachidic acid and  $\beta$ -methylglutanic acid.

Sinha (1960) identified the yellow fixed oil (yield 18.78%) obtained from the seeds of C. ternatea as a  $\gamma$ -sitosterol based upon the preparation of acetate and benzoic derivatives and comparing their comparative compositions, melting points and rotations with those of known sitosterols. The sterol's properties were described as: obtained as colorless shiny plates; molecular formula of  $C_{20}H_{50}O$ ; negative test for N,P,S, and halogens; positive Salkowski reaction and digitonin test; coloration assumed purple to blue, then to green in Liebermann Burchard reaction; purple coloration in Steinkile Kehlenberg reaction, which turned cobalt blue on exposure to light.

Sinha (1960) described a  $\sigma$ -lactone compound from alcoholic extract of the dried leaves of Clitoria mariana with a molecular formula of  $C_{26}H_{50}O_2$ . From the nearly identical properties described and treatments of the new extract, the chemical is "aparajitin," although Sinha has no reference to the work of Tiwari and Gupta.

Gupta and Lal (1968) reported the isolation of hexacosanol,  $\beta$ -sitosterol and an anthoxanthin glucoside from the seeds of C. ternatea. On acid hydrolysis, the anthoxanthin glucoside yielded quercetin and glucose. Chromatography of the amino acid composition enabled the identification of the essential amino acids lysine, valine, methionine, phenylalanine and isoleucine in the protein hydrolysate, along with aspartic acid, serine, glycine, alanine, glutamic acid, tryosine, proline, argisine and histidine.

Kulshrestha, Kumar and Khare (1968) detected cersulfate positive compounds by thin layer chromatography in the butanol-soluble fraction of the seeds of C. ternatea. Four of the six crystalline compounds were identified as adenosine, kaempferol-3-rhamnoglucoside,

p-hydroxy-cinnamic acid and ethyl- $\alpha$ -D-galactopyranoside. The remaining two compounds were a polypeptide and a phenolglycoside.

Aiyar, Narayanan, Seshadri, and Vydeeswaran (1973) reported three glycosides of kaempferol from the leaves of C. ternatea. The ethyl acetate soluble part of the ethanol extract gave three compounds on chromatography identified as follows: Compound A (m.p. 198-200°) as kaempferol-3-monoglucoside; Compound B (m.p. 215-7°) as kaempferol-3-O-rhamnosyl (1 $\rightarrow$ 6) glucoside; Compound C (m.p. 188-90°) as kaempferol-3-rhamnosyl (1 $\rightarrow$ 6) galactoside. Light petroleum ether and ether extracts on chromatography yielded waxy matter, chlorophyll and  $\beta$ -sitosterol.

#### Cytological Research

Very little research has been done on the chromosomes of Clitoria. From the few counts reported, the species appear to fall into two distinct groups which correlate with the morphological characters which indicate two subgeneric lines for the species involved. The subgenus Clitoria has  $x=8$ , and is based on one species. The subgenus Neurocarpum has  $x=12$ , and is based on four species. The chromosome counts reported for Clitoria species are tabulated in Table 2.

Tschechow and Kartaschowa (1932) included C. ternatea as one of the species in their cytological survey of the tribe Phaseoleae. They provided the first chromosome count for the genus ( $2n=16$ ). A camera lucida drawing of the chromosomes was provided. They remarked that C. ternatea differs uniquely from the other species in the tribe both by the number of  $x=8$  (versus  $x=11, 12, 19, 20$  in other species, the latter pair of counts pertaining to other species in the same subtribe)

Table 2. Reported chromosome numbers in Clitoria species.Subgenus CLITORIA

Species	n	2n	date	reporter
ternatea		16	1932	Tschechow & Kartaschowa
ternatea	8		1938	Senn
ternatea		16	1953	Frahm-Leliveld
ternatea		16	1957	Frahm-Leliveld
ternatea		16	1962	Shibata
ternatea	8		1967	Mitra & Datta
ternatea (double)	8		1961	Saroja

Subgenus NEUROCARPUM

Species	n	2n	date	reporter
cordobensis		24	1951	Krapovickas & Krapovickas
falcata*		24	1960	Frahm-Leliveld
laurifolia		24	1957	Frahm-Leliveld
macrophylla	12		1971	Larsen

\*Chromosome number reported under the synonym C. rubiginosa

and by the two distinct chromosome sizes, four long chromosomes and four short ones. Even among the two groups, these eight chromosomes are not equal in size, although there appears to be a 3:1 size relationship between the long and short chromosomes.

Krapovickas and Krapovickas (1951) provided a count ( $2n=24$ ) and an illustration of the chromosomes of Clitoria cordobensis. They concluded, after comparison to C. ternatea, that there are either two distinct groups of species with  $x=8$  and  $x=12$  respectively, or that C. cordobensis was a triploid.

Sen and Krishnan (1961b) reported that binucleate pollen mother cells occur at a very low frequency in C. ternatea. One of the two nuclei was always smaller. Meiosis was not observed in these cells beyond early diakinesis. An illustration of a binucleated cell with both nuclei at pachytene was presented.

#### Developmental Research

Developmental research has been undertaken almost entirely upon C. ternatea, primarily by Indian researchers. Studies have been conducted on endosperm, embryo growth, seed germination, and seedling growth.

Rau (1951) described the endosperm development in C. ternatea along with four other selected papilionaceous species. The endosperm is of the nuclear type, with the free endosperm nuclei arranged along the sides of the inner layer of the inner integument. As the seed cavity at the chalazal end widens in later stages, the massive nucellus projects into it. The antipodal end of the embryo sac is wedged into this nucellar mass. Free endosperm nuclei lying in dense cytoplasm



gather here. Cytokinesis of endosperm nuclei occurs when the embryo is in an advanced stage of development. The cell formation is restricted to just one or two layers around the embryo; the remaining part retains free nuclei.

Padmanabhan (1966) reported growing excised embryonal axes in vitro on Mitsch's basal medium supplemented with vitamins. He concluded that the course of axis growth was remarkably similar to natural germination events, namely; (1) growth of root (day 2-3), (2) elongation of hypocotyl (day 4), and (3) activation of shoot bud (after day 20). Elongation was not affected by removal of the apical bud. From these results the observation that upper hypocotyl curves, he concluded that the embryonal organs are capable of independent development when isolated, but follow the same developmental pattern as in the entire embryo.

Lakshmann and Padmanabhan (1968) reported the effect of the antibiotic ascochitine on in vitro growth of Clitoria ternatea. They concluded that, in general, the toxin exerted its effects on the embryos grown in vitro at much lower concentrations than is required to cause perceptible effects on the germinating seeds. Ascochitine produced total inhibition of root growth, presumably because root proteins were easily denatured. A low percentage of embryos did produce callusing of the root apex and the hypocotyl. The shoot meristem was not affected by the toxin, presumably because the shoot meristem converts a large quantity of the toxin to dihydroascochitine, rendering this toxin benign.

Mullick and Chatterji (1967a) reported on seed germination of C. ternatea. Imbibition and germination behavior was

studied under various eco-physiological conditions in the laboratory, conditions similar to those found in the wild. They concluded: light had no effect on either behavior; seeds germinated mostly at a temperature of  $35^{\circ} \pm 2^{\circ}\text{C}$ ; better imbibition and germination behavior were obtained when seeds were subjected to physical and chemical treatments of impaction with sand, impaction without sand, hot water, concentrated sulphuric acid, absolute alcohol and normal potassium hydroxide. Seed imbibition and germination behavior were about fifteen per cent under laboratory conditions of light and temperature.

Mullick and Chatterji (1967b) reported the effects of sodium cyanide on seed germination of C. ternatea. They concluded that seeds soaked for 24 hours in 100 ppm of aqueous sodium cyanide solution accelerated imbibition, germination, and promoted early growth of the seedlings. Increased concentrations produced inhibitory effects leading to the suppression of normal seed germination and growth. Light and temperature did not influence the chemical effect on the seeds.

A. P. de Candolle (1825) described seedling development based upon three species of Clitoria and illustrated various stages in Plate IX (Figures 33-35). Two of these species are now placed in the genus Centrosema. The illustrations show plants with 3-foliate leaves, but the leaflet shape tends to indicate de Candolle's Figure 33 as C. ternatea by elimination. Clitoria ternatea typically is 5- and 7-foliate; however, Rizzini's study (1963) clarifies the apparent discrepancy in leaflet number. With the data representing a mixture of two genera, de Candolle's treatment becomes a non-reliable source of seedling development information in Clitoria.

Compton (1912) described the seedling morphology and vascular structure of C. ternatea in early developmental stages. The cotyledons are 21 x 14 mm, remain enclosed in the thick, foliaceous, oblong testa, cordate at the base. Germination is epigeal. Hydrocotyl gradually tapers to a long, much branched primary root. The hypocotyl exhibits scattered hairs with a transverse wall and recurved pointed tip. The root is tetrarch with a central pith far below the collet region. Each phloem strand contains a group of fibers. As one passes up the hypocotyl, the xylem breaks into groups. Midway up the hydrocotyl, each xylem quadrant is represented by three groups, a medium protoxylem tissue and two lateral metaxylem tissues. Higher up the hypocotyl, the four root protoxylem strands divide and join their metaxylem strands, producing eight bundles of xylem. Each cotyledon receives four of these bundles along with two bands of phloem.

Rizzini (1963) reported that Clitoria seeds exhibit one of two types of germination. Hypogeal germination proceeds quite slowly. The cotyledons remain within the soil inside their testa, are non-green, and maintain their volume, not growing. The primary leaves are simple. The second pair of leaves have the normal three leaflets. Species exhibiting hypogeal germination were C. laurifolia, C. rubiginosa (= C. falcata), and C. guianensis. Epigeal germination proceeds rapidly. The cotyledons shed their testa and are elevated above the soil level, are green, and grow well. The primary leaves appear above the cotyledons, and are distinct in shape and number of leaflets from following leaves. For these species, the second pair of leaves is similar to the normal 3-foliate leaves. An exception was C. ternatea where the second pair of leaves (3 leaflets) were dissimilar to typical

cauline leaves (5 and 7 leaflets). Species which exhibited epigeal germination were C. ternatea, C. amazonum, and C. racemosa (= C. fairchildiana). Rizzini concluded that germination type was constant and could be used as a sectional character, with hypogeal germination characteristic of section Neurocarpum (=subgenus Neurocarpum) and epigeal germination characteristic of sections Ternatea (=subgenus Clitoria) and Clitorianthes (=subgenus Bractearia).

### Morphological Research

Morphological research on Clitoria has been on the double flowers of C. ternatea, primarily by Indian investigators, and on the cleistogamous flowers of several species, by a German investigator. Both topics will be taken up in more detail elsewhere (double flowers, p. 523; cleistogamy, p. 133). A brief summary of their work is presented here.

Sirdeshmukh (1955) reported an actinomorphic flower of C. ternatea with five petals, all standard-like, with the other flowers on the plant being papilionaceous. The calyx, androecium, and gynoecium were normal.

Sen and Krishnan (1961a) reported their genetic research on double flowers of C. ternatea. Double flowers are non-papilionaceous with ten free stamens in contrast to normal flowers of papilionaceous corolla and diadelphic androecium. Double flowers were crossed with blue and white varieties of the normal flowers. The  $F_2$  generations indicated a 3:1 frequency of double to single flower types. They concluded that the double flowers originated through a dominant gene mutation, changing the organs vital to taxonomic classification, and at the same time,

maintaining the viability and fertility of the plant through the production of large numbers of fruits.

Saroja (1961) reported his findings on the double flowers of C. ternatea. He found the chromosome number and size in agreement with single flower results reported by earlier investigators. However, examination of pollen grains showed differences. The pollen grains of double flowers were larger and the percentage of fertile pollen was lower. He concluded that the action of the mutant gene is manifested in different ways and therefore may be considered pleiotropic.

Harms (1907c) described the occurrence of cleistogamous flowers in three species of Clitoria, namely C. laurifolia (reported under synonym C. cajanifolia), C. falcata (reported under synonym C. glycinoides) and C. guianensis. All three species were illustrated. He described and compared the calyx, corolla, androecium, and gynoecium of cleistogamous and chasmogamous flowers.

In describing a new species, Burkart (1941) reported the occurrence of cleistogamous flowers in C. cordobensis. He compared these flowers with those reported by Harms.

#### Agronomic Research

Most of the agronomic research has utilized C. ternatea along with other legumes in pasture surveys and experimental plots to determine its usability as a forage crop. Nutrient studies have been reported using sheep, although the species is reported in a number of floras and economic botany references, to also be edible by cattle and goats.

Holland and Joachim (1933) conducted soil erosion experiments for six years on a steep slope planted with tea in Ceylon (=Sri Lanka).

Of the two legumes used, one was the shrubby C. cajanifolia (= C. laurifolia) planted as a hedge. The ulitoria hedge grew well from the beginning and proved most satisfactory as a contour hedge, reducing erosion in its plots by 92 per cent.

Kok, Machado, and Meirelles (1943) reported the results of digestion trials with sheep utilizing the hay of several legumes, including C. ternatea. Cuttings of the species were made 74 days after sowing, in full blossom, at a medial height of 70 cm, and fed to three sheep. Chemical results analyzing sheep feces, data on quantity consumed, digestibility coefficients, and nutrient values were presented. They concluded that C. ternatea hay compares in quality with that of alfalfa in early bloom.

In another study with sheep, Katiyar, Ranjhan, and Shukla (1970) reported their experimental studies on yield, chemical composition, and nutritional value of C. ternatea. They noted that: the plant is suitable for growing in association with grasses, provided it is protected from summer drought and winter frost; the sheep preferred grazing on the leaves, flowers, and pods, but not on the harder woody stems; the sheep were able to consume sufficient quantity because of heavy plant production of edible structures; the chemical composition data of C. ternatea compared favorably with most of the cultivated legume crops; the nutrients were equally digestible in both green and hay fodder; and C. ternatea alone or in association with other perennial grasses proved promising for forage.

Hassell (1945) reported his experimental results of several legumes established in pastures in Queensland, Australia. He noted in a brief descriptive note of the species, that cattle are particularly

fond of C. ternatea. Also noted was the difficulty of eradicating the species because of its deep-rooting habit and heavy seeding. Hassell planted seeds of all native legumes found growing in the Central district in experimental grazing plots. Two introduced legumes were also planted. He concluded that germination was very poor for all species (which would include C. ternatea) except for the two introduced legumes.

Bunting and Lea (1956) reported their observations on legumes and grasses of natural and established pastures in the Sudan. Three strains of C. ternatea were sown on plots and observed for three years. Two strains were affected by viral disease, the third apparently resistant strain growing well. This strain, along with Rhodes grass, was established in a low lying area subjected to rain floodings, and appeared promising in providing a useful means of associating some stock with arable development in the region.

Oakes (1970) evaluated various legumes in field trials in St. Croix, U.S. Virgin Islands, to determine which legumes possess characteristics which make their utilization desirable and advantageous in supplying forage and improving forage quality at critical times when feed supplies are low, in poor quality, and in maximum demand. Forage legumes were established by seedling on Fredensborg clay, in pure and mixed stands, (Clitoria ternatea grown with grass Panicum maximum in alternating rows), and without the addition of fertilizer. Oakes concluded that C. ternatea would make a significant contribution to browse and pollard available to livestock.

Palynological Research

No description of pollen grains has been found. Clitoria is absent from standard palynological references (e.g., Erdtman, 1952).



## MORPHOLOGY

A number of Clitoria species exhibit great morphological variation in size, form, and pubescence of the vegetative, flowering, and fruiting structures. These variations often can be observed in the same population or on the same individual plant. Yet despite the variations, an array of morphological facies permits recognition of a constant pattern. Patterns of variation can also be observed above the species level. Observed patterns of variation for a structure will be noted, both within the subgenus and in comparison to other subgenera. Comparisons with the related genera of the Glycineae will be noted using the descriptive treatment of Hutchinson (1964) as a model.

### Habit

The habit of Clitoria has the greatest variability to be found within the Glycineae, and perhaps one of the most variable of the Papilionaceous legume genera. Genera of the Glycineae are perennial herbs or shrubs with many genera having climbing properties. The members of Clitoria are trees, shrubs, lianas, subshrubs (or woody herbs), perennial herbs, and herbaceous twining vines, with some species exhibiting intermediate habits.

Three woody habit types are associated with the subgenus Bractearia and absent (one exception, C. lasciva, a liana of subgenus Clitoria) from the other subgenera. These plants are found mostly in

tropical forests and exhibit tree, tall shrub, or liana habits. Field observations on these plants are sparsely reported. Trees are recorded up to 30 m tall and 60 cm d.b.h. Clitoria fairchildiana is noted for its arching virgate branches that droop, touching the ground to form a canopy. Tall erect shrubs (sometimes reported as treelets) are usually 3-8 m tall. Occasionally reported is a subclimbing property of their upper branches (e.g., C. amazonum). Woody vines or lianas climb by their twining stems. No specialized climbing structures (e.g., adventitious roots) have been noted. Occasionally a liana species has an individual reported growing as an erect shrub in open areas (e.g., C. javitensis), or a species of disjunct distribution exhibiting the liana habit in one region and a shrub habit in another region (e.g., C. leptostachya, a liana in Guyana, a shrub in Brazil).

The plants of the subgenus Neurocarpum are usually associated with drier, water-deficient, open habitats. They exhibit habits of shrubs, subshrubs, perennial suffrutescent herbs, and herbaceous twining vines. Shrubs are low-growing, or to 5 m tall, often associated with mountainous terrain. Clitoria polystachya is the only shrub species with a report of a climbing apex (one Mexican population). Subshrubs (or woody herbs) are plants with one to a few erect stems above ground, usually 0.5-1 m tall, the stems well lignified nearly the entire length (e.g., C. guianensis). They are usually found in savannas and open grasslands. During periods of water stress, all structures are dropped leaving only the main stem axis above ground, which may persist for a long period of time, is fire-tolerant, and eventually is aborted. When water becomes available, new stem(s) are produced. Suffrutescent herbs are usually erect, the stems becoming more or less lax with age

(e.g., C. fragrans). The herbaceous stem apices may elongate and become twining vines (e.g., C. mariana), or prostrate creepers (e.g., C. mexicana), or procumbent (e.g., C. nana). Herbaceous vines (e.g., C. falcata) are usually associated with forests, and are high climbers, although they will creep about the forest floor in more open areas. Vines of subgenus Clitoria grow in more open areas, often forming dense tangled mats, but will climb when conditions are suitable (e.g., C. ternatea). The base of the plant is suffrutescent.

The few species of the subgenus Clitoria are suffrutescent herbs (similar to those of the subgenus Neurocarpum) or vines as noted above, with one liana species.

#### Stems and Branches

Stems and branches of most species are longitudinally striated. In non-climbing plants, one can follow these striations and observe a slight twisting of the axis. A gradient of pubescence usually exists along these axes, from densely pubescent near the tip, to glabrate towards the base. Juvenile parts often exhibit a subquadrangular or angular cross-section, becoming rounded to terete with age. Internodes are often hollow in the center of the woody plants with a few species having a solid pith. The entire plant of the more herbaceous members and some subshrubs are mounted on herbaria sheets; thus the pith condition is inconspicuous, although the same pattern occurs as in the woody plants. Bark is rarely noted in field observations, although it tends to be somewhat smooth with numerous cracks on the trunk when reported. Only wood samples of C. nervosa were seen. Bark of smaller

diameter stems and branches is grayish to dark brown, smooth, splitting in longitudinal strips to expose light-colored wood beneath.

Subterranean stems (usually called xylopodia) of the subshrubs and perennial erect herbs are poorly collected. Usually the xylopodium is woody, unbranched, often knobby at the apex where the aerial portions sprout, rootless or bearing one to a few short roots of 0.5-2 mm diameter, glabrate or bearing scattered microscopic uncinata hairs. Xylopodia are short with a distinct elongated axis that parallels the surface, and rarely collected with an elongated root-like appendage at its distal end. Field observations of C. mariana and C. fragrans indicate that the larger rhizome-like structure lies near the surface of the soil with the distal portion moving deeply down into the soil at a thirty to forty-five degree angle. The distal portion is 2 m or more long (and is often broken during the digging process) and 2-5 mm thick. Occasionally there are swollen portions to 10 cm long and 1 cm diameter in this distal portion.

#### Pubescence

Trichomes are present on most plant structures, and along with other characteristics, can be useful in distinguishing two superficially similar species (e.g., C. javitensis and C. sagotii). They occur in two sizes, microscopic (must be viewed at 25-30X) and macroscopic (viewed at 10X or seen with naked eye). Microscopic trichomes are uniseriate, usually bicellular to multicellular, and uncinata. These hairs are inconspicuous and often difficult to view even when one knows that they are present. They are best observed by looking along the edge of the surface rather than viewed in a face view. The hairs

are also usually more readily seen along major nerves. Uncinate trichomes are often found along the various axes of the inflorescence, on the calyx, on the outer vexillum surface, on leaf surfaces and nerves, on bracts and bracteoles, on legume valves and sutures, on ovaries, and infrequently on the ala, carina, and staminal tube. Macroscopic hairs, if present, often mask the uncinate trichomes. Macroscopic trichomes are usually 0.3-0.8 (1.0) mm long, with only a few species exhibiting longer hairs. They are often appressed or subappressed, less frequently falcate to erect. The term "minute" will be used for trichomes 0.1-0.5 mm long. The term "long" will be used for trichomes greater than 1 mm long.

Juvenile structures are often densely pubescent, becoming moderately pubescent to glabrate with age. Those structures lacking trichomes are: the inner surface of the vexillum, calyx, stipules, stipels, bracts and bracteoles; the ala and carina (usually); the androecium (except the tube apex occasionally or the free filaments); and the seed. The vegetative structures (except as noted), the gynoecium, the outer surfaces of the vexillum, calyx, bracts, and bracteoles, and the fruit possess some degree of pubescence. Fruits and calyx often will appear glabrous because of the inconspicuous, microscopic trichomes. The upper leaf surface becomes glabrate to glabrous early, with vestigial hairs sometimes persisting on the midrib and major nerves. Those species which retain the pubescence on the upper surface are worth noting.

### Leaves

Leaves are alternate, odd-pinnately compound, usually 3-foliate, less commonly 5- or 7-foliate, infrequently unifoliate, rarely 9- or 11-foliate. The terminal leaflet is usually slightly larger to much larger than the lateral leaflets. Leaves have been often cited as "trifoliate," an ambiguous term which can apply to palmately compound leaves. When used with the genus Clitoria, the term refers to the common condition of three pinnate leaflets. Leaves are usually stalked, although nearly half the members of the subgenus Neurocarpum have subsessile leaves in which the petiole is shorter than the rachis. Unifoliate leaves are sessile with the exception of the Asian C. cordiformis and C. macrophylla. In those plants bearing both trifoliate and unifoliate leaves, the trifoliate leaves are similar in appearance to the terminal leaflet, although often broader. The unifoliate leaf is attached by its petiolule and appears to be a terminal leaflet in which the petiole, rachis, and lateral leaflets were lost. In C. cordiformis and C. macrophylla, the leaf's petiolule is attached to a long stalk which is somewhat rugose laterally at its apex, a condition observed only in petiole bases and petiolules of other species. This suggests a terminal leaflet and petiole, with the rachis and lateral leaflets lost. In C. pozuzoensis, a variation occurs in which some leaves appear palmately compound due to the reduction and near elimination of the rachis. Leaflets of C. epetiolata are retained while the petiole and rachis are both lost, the leaf thus becoming digitately compound.

### Leaflet

Leaflets are polymorphic in shape and size within many species. Leaflets are entire with revolute margins occurring only in C. coriacea and C. tunuhiensis. The apex is more or less obtuse, usually abruptly to rapidly forming a short to long acumen in the more ligneous species. In advanced species, the acumen is lost, the leaflet apex being obtuse to retuse, or occasionally emarginate. The extreme apex is often more or less mucronately bristled. The base is cuneate to rotund, rarely cordate. Nerves are conspicuous, prominently raised below with the midrib and major nerves impressed to weakly raised above. The midrib sometimes appears raised (will catch a fingernail) because of a shallow groove on each side of the midrib. Primary nerves are ascending, usually arcuate to falcate toward the margin, anastomosed with the nerve above, and fairly consistent in number. Secondary nerves are conspicuously reticulate, especially below. The upper surface is typically green to dark green, glabrate to glabrous when matured. The lower surface is green to pale green, often pubescent, and glaucous to glaucescent in a number of species of the subgenus Neurocarpum. Minute wax globules are present on the lower leaf surface of C. coriacea.

### Stipules and Stipels

Stipules and stipels are persistent to deciduous, rarely caducous, longitudinally striated, and paired. Stipules are erect, appressed, often ciliate, usually 2-12 mm long and 1-4 (6) mm wide. They are caducous in C. andrei, C. dendrina, and C. brachystegia. Stipules are conspicuously elongated in C. plumosa (2-3 cm) and C. kaieteurensis (1-2 cm), and become minutely foliaceous in C. stipularis (13-19 mm x 7-13 mm). Stipule length can be variable in some species (even on an

individual plant) by half a centimeter or more (i.e., C. obidensis, C. guianensis). Stipels are subequal to or shorter than the stipules in length, and much narrower. Terminal stipels are often conspicuously shorter than the lateral stipels. Stipels are typically less than 1.5 mm wide except in C. kaessneri (1.5-2 mm) and C. stipularis (2-3 mm). Elongated stipels occur only in C. plumosa (1-2 cm).

#### Petiole and Rachis

The leaf stalk is longitudinally striated, quadrangular to terete; its pubescence is usually similar to that of stems or branches, and it sometimes bears one or two caniculi on its adaxial side. The rachis is similar to the petiole; sometimes it is weakly compressed laterally, and usually shorter, except in the sessile leaves of many members of subgenus Neurocarpum where it is longer than the petiole, or in the subgenus Clitoria where the combined rachis segments exceed the petiole. Sessile leaves have petioles 0.2-2 cm long.

#### Petiolule

The petiolule is usually subquadrate, dark-colored, rugose, and more densely pubescent than the petiole and rachis.

#### Observations

Measurements of each leaf structure form nearly a continuous gradient within the genus. Stipules and stipels of most species are similar in shape with overlapping sizes. Leaflet size, shape, and apex form gradients within the total variation continuum. Petiole and rachis size is usually variable within a species, except for those species with sessile leaves. Leaflet number and petiolule length appear more reliable as diagnostic characteristics.



At the subgeneric level, leaf structures are best used as supportive characters, but there are exceptions. These structures are summarized in Table 3. In general, leaves of the species of subgenus Bractearia are large, long-stalked, and 3-foliate, with the leaflets acuminate and large petioluled. Leaves of subgenus Clitoria species are small, short-stalked, and 5- to 11-foliate, with short-petioluled leaflets having obtuse to emarginate apices. Leaves of species in subgenus Neurocarpum are highly variable and difficult to characterize. But they are usually distinguished from Clitoria species by a smaller leaflet number and from Bractearia species by a generally smaller size.

#### Inflorescence

The inflorescence is axillary, usually solitary, or terminal in some tree and tall shrub species, or cauliflorous in some liana species. Cauliflorous inflorescences are usually few to fascicled, located below the leaves. Inflorescences are basically racemose, infrequently paniculate, or commonly reduced to one or two flowers in advanced species. Inflorescences are typically chasmogamous or occasionally cleistogamous (subgenus Neurocarpum), very rarely chasmocleistogamous. Flowers are one to many, but paired at the nodes. The central axis is angular to terete, longitudinally striated, often bearing moderate to dense, short or microscopic trichomes, and more or less nodose. This inflorescence is similar to other genera of the Glycineae which typically have axillary, racemose, chasmogamous, and more or less nodose inflorescences. The genus Clitoria is unique in possessing cauliferous, cleistogamous (except the genus Amphicarpa),

Table 3. Comparison of leaves among the subgenera.

CHARACTER	BRACTEARIA	CLITORIA	NEUROCARPUM
Leaflet number	3	5, 7, 9, 11 ( <u>C. kaessneri</u> = 3 & 1)	3, 3 & 1, 1
Petiolule	Large, 4-10 mm	Small, 1-3 mm	Small to medium, 1-5 (6) mm ( <u>C. stipularis</u> = 4-8 mm)
Leaf apex Acumen	Acuminate (obtuse) 0.5-3 cm	Obtuse to emarginate	Obtuse (Acuminate)(Emarginate) 0.5-1 (2) cm
Petiole	Long, 4-10 (16) cm	Subsessile, 0.2-2 cm Short, 2-6 cm	Subsessile, 0.2-2 cm Short to medium, 2-6 (10) cm Absent
Petiole vs rachis	Much longer	Much shorter	Much longer in stalked leaves to shorter in sessile leaves
Leaflet size Length Width	Large (6) 8-20 cm 3-9 (18) cm	Small (Medium) 2-7 (10) cm 1-3 cm	Variable 2-10 (15) cm 1-9 cm

and chasmocleistogamous inflorescences. Other genera of the Glycineae lack lianas, thus lack cauliferous inflorescences.

#### Chasmogamous Inflorescences

Inflorescences which bear the typical cross-pollinated, papilionaceous flowers are usually lignified to some degree, but become highly woody in those species of the subgenus Bractearia. These inflorescences bear numerous flowers which abort at the lower nodes. The inflorescence nodes are thickened, knobby, projecting outward from the main axis, a condition in legume axes called "nodose." There are four main inflorescence types which can be recognized in the subgenus: the panicle, the subpanicle, the nodose raceme, and the flexuous raceme. Examples of inflorescence types are illustrated in Figure 3.

The woody panicle is associated with tree species bearing the primitive bracteoles (cf. pp. 113-114), and it is probably the primitive inflorescence type within the genus. The woody panicle has a central main axis with primary lateral branches (5-30 mm long) bearing a pair of flowers at its apex (rarely three flowers). Flowers abort first at their pedicel base, leaving the primary lateral branch with its persistent bracts. Then the primary branch will abort leaving a nodose axis. Examples of this inflorescence type is found in C. amazonum and C. arborea.

The woody subpanicle is derived from the woody panicle and superficially appears racemose, although the primary branches are present, minute, usually 1-5 mm long. Examples of this inflorescence type is found in C. fairchildiana and C. nervosa. Both the woody panicle and subpanicle are found only in the section Bractearia.

Figure 3. Generalized inflorescence types in *Clitoria*. Top row, woody inflorescences: (a) woody panicle, as found in *C. arborea*; (b) woody subpanicle, as found in *C. fairchildiana*; (c) nodose raceme, as found in *C. javitensis*; (d) flexuose raceme, as found in *C. flexuosa*. Bottom row, herbaceous inflorescences: (e) panicle, as found in *C. polystachya*; (f) few-flowered raceme, as found in *C. mariana* var. *orientalis*; (g) biflowered or pedunculate raceme, as found in *C. epetiolata*; (h) uniflowered raceme, as found in *C. ternatea*. (Dots on woody inflorescence axis represent woody knobs, or "nodose" condition. Flowers and primary branches commonly abort, thus, inflorescences illustrated reflect this and were drawn from specimens.)



a



b



c



d



e



f



g



h

The flexuous raceme is limited to the section Flexuosa, and is also associated with primitive bracteoles. This inflorescence has a weakly to conspicuously zigzag main axis, with primary lateral branches 1-2 mm long or lacking. Examples of this inflorescence type are found in C. flexuosa and C. pozuzoensis.

The woody raceme has a conspicuous nodose axis from which a pair of pedicels is borne. This is the most common inflorescence type in the subgenus, and is associated with the advanced bracteole type. It can become extremely elongated (as in C. leptostachya and C. pendens, to 1 m long) or very short, nearly sessile, with the nodose aspect inconspicuous (as in C. sagotii and C. coriacea, sessile to 0.5 cm long).

Herbaceous inflorescences usually bear a reduced number of flowers, often two, less commonly few to many flowers. Other genera of the Glycineae with their herbaceous inflorescences typically are several to multi-flowered. Panicles are uncommon, but herbaceous panicles are found in a few shrubby Mexican species (e.g., C. polystachya and C. monticola). The primary lateral branches of the panicle are variable in length, typically with two to three flowers at its apex, infrequently further branched in large panicles. Racemes have a peduncle with a pair of flowers (one may abort) at its apex, rarely having a short internode segment which bears an additional two or four flowers. This inflorescence type is typified by C. falcata and C. guianensis. The few-flowered raceme commonly bears (two) four to eight flowers, as is typically found in C. mexicana and C. australis. The ultimate reduction occurs in unflowered racemes as in C. ternatea,

where the solitary flower is borne laterally from the peduncle apex, or sometimes terminally. Rarely a second flower is produced.

#### Cleistogamous Inflorescences

Cleistogamous inflorescences occur only in some species of the subgenus Neurocarpum. They are similar to the chasmogamous inflorescence type of the species, usually occurring at the lower nodes. Inflorescences are ascending and remain so, never pushing the fruits towards or into the soil. Occasionally these inflorescences appear at the upper nodes above the chasmogamous inflorescences. Although both chasmogamous and cleistogamous inflorescences may occur at the same time on a plant (plant chasmodichogamous), plants are usually collected with only one inflorescence type.

#### Chasmocleistogamous Inflorescences

Chasmocleistogamy is extremely rare in the genus, observed only once in two species, and reported here for the first time in the genus. In both cases, the inflorescence was a two-flowered raceme in which one pedicel bore a chasmogamous flower while the other pedicel bore a cleistogamous flower in fruit. Chasmocleistogamy occurred in a specimen of C. guianensis from Minas Gerais, Brazil (Irwin 2384, US 2324452). The cleistogamous flower bore a dehiscent fruit. The chasmogamous flower bore the persistent calyx, the petals aborted. Chasmocleistogamy occurred in a specimen of C. mariana from Pennsylvania, United States of America (J.J. Carter s.n., "Culley's, Lan. Co., 1 Aug 1906," PH). The cleistogamous flower was in a juvenile fruiting stage. The chasmogamous flower was in full bloom. In both collections, all other flowers were cleistogamous on the plant, as well as in the duplicate inflorescences seen (Irwin: NY, UC; Carter: no

duplicates seen). These chasmocleistogamous inflorescences are illustrated in Figure 4.

### Bracts

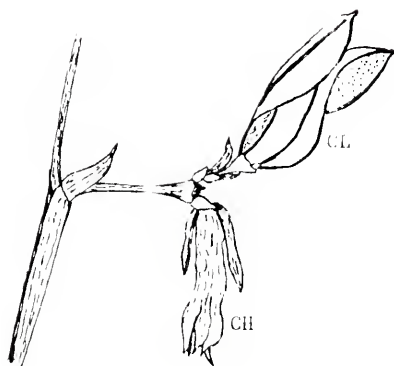
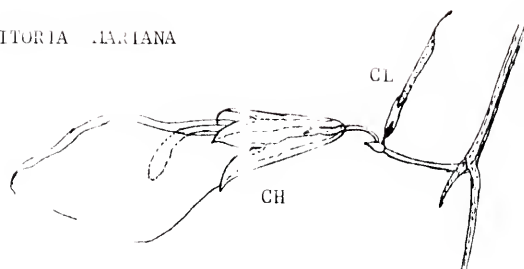
Bracts are stipule-like, longitudinally striated, pubescent outside, often ciliate, and found in three series below the base of the pedicels. The inner pair of bracts is caducous, usually the smallest, and located between the pair of pedicels. The middle pair of bracts is the most conspicuous, persistent, usually the largest, and located opposite the pedicels, each bract concave and more or less appressed around the pedicel, becoming spreading to reflexed in age. The outer pair of bracts is deciduous to semipersistent, usually nearly as large as the middle pair, and located between the pedicels. Unless otherwise noted, descriptions of bracts will refer to the middle pair (i.e., the bracts usually found).

Bracts are commonly 3-7 mm long and 1-4 mm wide. Elongated bracts occur in C. flexuosus, C. woytkowskia, C. obidensis, C. plumosa, C. stipularis, and C. densiflora, reaching 16 mm in length. Broadened bracts occur in C. amazonum, C. flexuosus, and C. woytkowskia. Clitoria amazonum has bracts 3-6 mm wide, whereas the bracts of the latter two species are very large, conspicuous, and foliaceous, up to 9 mm wide. Conspicuously reduced bracts of 1-3 mm long and 0.5-1.5 mm wide occur in the woody species C. dendrina, C. brachycalyx, C. brachystegia, C. leptostachya, and C. pendens. Minute, inconspicuous bracts of 1-2 mm long and 0.2-0.4 mm wide occur in the nonrelated herb, C. heterophylla.



Figure 4. Chasmocleistogamy in *Clitoria*. Leaves removed from illustration. *C. guianensis* (Irwin 2384, US 2324452). *C. mariana* (J. J. Carter s.n., Culley's, Lan. Co. Penn., Aug 1, 1906, PH).

CLITORIA LARIANA



CLITORIA JULIANENSIS

CH = Chasmogamous Flower

CL = Cleistogamous Flower

### Pedicels

The pedicels are paired, longitudinally striated, usually pubescent, conspicuously twisted, and less than 1 cm long. They become thicker in fruit, and woody in the subgenus Bractearia. When the flower aborts, the abscission zone occurs below the base of the pedicel.

### Bracteoles

The bracteoles are paired, persistent, longitudinally striated, pubescent outside, often ciliate, inserted on the pedicels between 0.5-1.0 mm below the calyx, rarely longer. In two sections of the subgenus Bractearia, the bracteoles are conspicuously large (more 1 cm long and 0.6 cm wide), coriaceous, subequal to longer than the calyx and protecting the flower in its bud state. Hutchinson (1969) indicated that these petaloid bracteoles are primitive and common in the subfamily Brachystegioidae of the Caesalpiniaceae and lacking in the Fabaceae. In other species of the subgenus, the bracteoles are typically 3-12 mm long and 1-3 (6) mm wide. Elongated bracteoles occur in C. plumosa (22-25 mm) and C. obidensis (20-35 mm), both also 3-6 mm wide. Reduced bracteoles of 1.5-3 mm occur in C. dendrina, C. brachycalyx, C. brachystegia and a variety of C. leptostachya, the same species with reduced bracts.

In the subgenus Clitoria, bracteoles are pellucid, translucent to semitransparent between the veins, and similar to the calyx. They shrink in size as the fruit is formed, unlike the coriaceous to cartilaginous bracteoles of the other subgenera which retain their size in fruit. In some members of C. ternatea, the bracteoles will become subequal to the calyx and enclose the flower in bud, although there are

reduced bracteoles (ca. half the calyx) which do not protect the bud even on the same plant. Minute bracteoles occur in C. heterophylla.

In the subgenus Neurocarpum, large bracteoles occur in C. stipularis and C. densiflora, but are not the petaloid protective bracteoles of the primitive type. These two species are noted for the large stipule-like structures, the stipules, bracts and bracteoles.

#### Observations

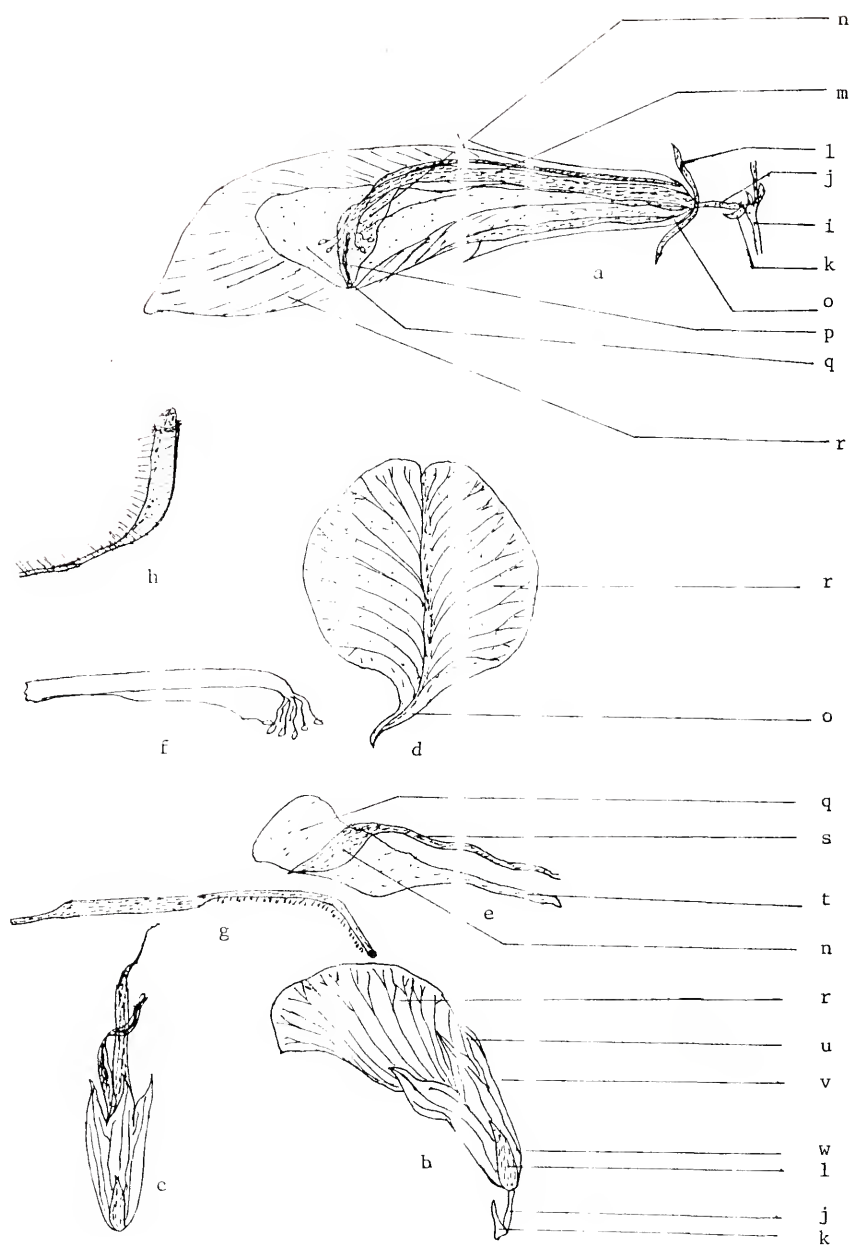
After the segregation of the subgenera by fruits and seeds, the inflorescences and bracteoles can be used as supportive characters. The differences have been noted and are summarized in Table 5. Bracteoles and inflorescence types are good characters to distinguish large groups of species, and sometimes serve as sectional characters. Bracts and pedicels are less reliable and best used to differentiate among small numbers of species.

#### Chasmogamous Flowers

Chasmogamous flowers are resupinate (a characteristic unique to the Glycineae, segregating it from other legumes), showy, papilionaceous, and blue to violet, pink to rose, or white, occasionally white fading yellow in the dried state. Flowers are complicate before opening, and are often mounted this way. In some members of C. ternatea, "double-flowers" occur which are 4- or 5-merous, actinomorphic, with all petals banner-like. A generalized chasmogamous flower is illustrated in Figure 5.

Chasmogamous flowers are of three distinct sizes in the subgenus Bractearia. Small flowers are uncommon, consistently 2-4 cm. Medium-sized flowers are 4-6 cm and nearly as common as the large-sized

Figure 5. A generalized chasmogamous flower. (a) flower, longitudinal section, x 2; (b) flower, x 1; (c) flower with petals aborted and early development of fruit, x 1; (d) vexillum, x 1; (e) ala and carinum, x 1; (f) androecium, x 1; (g) gynoecium, x 1; (h) apex of style, x 5; (i) peduncle; (j) pedicel; (k) bract; (l) bracteole; (m) androecium; (n) blade of keel petal; (o) vexillum claw; (p) style; (q) blade of wing petal; (r) blade of vexillum; (s) claw of keel petal; (t) claw of wing petal; (u) calyx lobe; (v) calyx throat; (w) swollen calyx base.



flowers of 6-8 cm. In two species, C. flexuosus and C. pozuzoensis, individual flowers sometimes reach 9.5 cm in length. In the other two subgenera, the same variation pattern is present except that the size range of medium and large flowers is half a centimeter less. Thus for subgenera Clitoria and Neurocarpum, small flowers are typically 2-3.5 (4) cm, medium-sized flowers are typically 3.5-5.5 cm, and large flowers are 5.5-7.5 cm. Flowers of 8-9.5 cm are absent in these two subgenera.

Flower color is variable and often different collectors report different colors for the same species. In general, flower color refers to the inner surface of the vexillum. The outer surface is whitish with the inner surface bearing the conspicuous pigmentation. The alae and carina are paler in color to whitish. The inner surface of the vexillum usually has a narrow patch of white or pale to deep yellow in the center near and extending down into the throat. The veins are numerous, dark-pigmented compared to the pigmentation of most of the vexillum surface, usually dark blue to violet or reddish, converging at the throat. This color generalization is based upon the few herbarium sheets with detailed field data on flower color and observations of live flowers in Florida populations (C. mariana, C. fragrans, and cultivated C. ternatea). In these populations, flower color was variable from light to darker shades.

In general, those species with blue to violet or rose to lilac or pink shades are associated with the medium-sized to large flowers, only occasionally with small flowers (e.g., C. dendrina). In general, species with white flowers have small flowers, although occasionally medium-sized (e.g., C. falcata). Yellow is a rare flower color in the

genus. Occasionally a species with white flowers has the flower color change from white to pale yellow with age, becoming a deeper yellow in the dried state (e.g., C. falcata).

### Calyx

The calyx is infundibular, persistent in fruit, conspicuously nerved, and 5-lobed. The upper two lobes (opposite vexillum, located dorsally due to resupination) are subconnate and the lowermost lobe (opposite carina, located ventrally due to resupination) is narrower, often longer. The calyx is usually pubescent, although often seemingly glabrate because of the microscopic hairs and few, appressed to suberect, inconspicuous macroscopic trichomes. The calyx is reported as green or violet-tinged to purplish towards the base (base darker-colored in dried state).

The tubular calyx is infundibular. The base rapidly expands outward, then gradually with a tapering expansion becomes broader up to the throat, where the lobes ascend but spread slightly outward. The swollen, expanded, usually dark-colored base indicates the location of the internal disc to which the claws of the petals and the androecium are attached. The lobes are broad, subequal, usually rapidly tapering above the middle to the apex, except for the narrower and usually longer ventral lobe. The lobes are shorter than to occasionally nearly subequal to the tube. An exception occurs in the Asian species of subgenus Neurocarpum, where the lobes are subequal to slightly longer than the tube (e.g., C. macrophylla). A shortened tubular calyx with reduced teeth occurs in section Brachycalyx of the subgenus Bractearia. The calyx becomes cup-shaped at maturity in



C. brachycalyx and C. brachystegia, superficially resembling some campanulate calices, although the lobes are different.

The calyx nerves are numerous and difficult to count in the subgenus Bractearia. In many species of the other two subgenera, there is a more or less prominently 10-nerved calyx. Five nerves ascend directly into the apex of the lobes. Five nerves ascend to the throat and beneath the sinus, dichotomously forked with the branch nerves radiating into each adjacent lobe, more or less near the margin, and ascending to the lobe apex. The lobes thus appear prominently 3-nerved. These nerves which arise from the primary nerves are more or less prominent in individual flowers.

Calyx texture is difficult to characterize. It shows no apparent shrinking as it persists during the fruiting stage of the plant in subgenera Bractearia and Neurocarpum, and is more coriaceous in the former subgenus and more cartilaginous in the latter. In the subgenus Clitoria, the calyx is subpellucid between the nerves and shrinks slightly during the fruiting stage.

Calyx measurements are often lacking in species descriptions of Clitoria. When reported, measurements include the entire calyx length, and are seldom indicative of the calyx parts (tube length, lobe length, tube width at throat). Tube lengths are variable, although patterns of variation are discernible. The large flowers of species in Bractearia typically have a calyx tube 1.5-2.5 cm long, with a few species to 3 cm (C. flexuosa, C. pozuzoensis) which nearly approximates the tube length of medium-sized flowers (1.3-2 cm). The large flowers of subgenus Neurocarpum agree with those in the subgenus Bractearia whereas the medium-size flowers of subgenus Neurocarpum (tube 0.7-1.6 cm) agree

with the tube length (0.7-1.3) of small-size flowers. In the subgenus Clitoria medium-size flowers agree with those in subgenus Neurocarpum whereas the small flowers possess tubes of 0.4-0.8 cm. Tube length often varies from one-half to one centimeter in large flowers and is less variable in small and medium-sized flowers.

The length of the lobes is highly variable, and does not correlate with flower size. The lobes of the majority of species in the subgenus Bractearia are 3-7 mm long whereas most species in the subgenus Neurocarpum are 7-12 mm long. Each subgenus has a few species in the opposite range of variation. Those species in subgenus Clitoria are split between these two ranges. Extremely short lobes (1-3 mm) occur in C. brachycalyx, C. brachystegia, C. glaberrima and C. heterophylla. Extremely long lobes (13-18 mm) occur in C. plumosa and C. densiflora, with lobes of 20-27 mm in C. obidensis. Calyx lobes are commonly 2-5 mm wide near their base with broad lobes (5-8 mm) occurring in C. obidensis and C. densiflora, and very narrow lobes (0.4-1 mm) in C. heterophylla. The ventral lobe of C. plumosa is unique in that its length (25-30 mm) greatly exceeds the length (13-18 mm) of the other four lobes.

The total length of the calyx (tube plus lobes) is variable, although large flowers generally have a calyx length of 2-4 (5) cm whereas small and medium-sized flowers have a calyx length of 1-3 cm. There is no distinct pattern along subgeneric lines. An extremely short calyx length (0.6-1.0) cm occurs in C. heterophylla and a very long calyx length (4-5.5 cm) is found in C. obidensis and C. plumosa.

The width of the calyx tube at the throat is variable, but in large flowers, calyx throats generally are 8-13 mm wide, whereas the

calyx throat width in small flowers is 3-6 mm (except for C. brachycalyx, 8-12 mm, and C. dendrina, 5-8 mm). Medium-sized flowers exhibit two calyx throat widths, the larger width of 8-13 mm and an intermediate width of 5-8 mm. Species of subgenus Bractearia are 7-13 mm wide (except C. dendrina, 5-8 mm). Species of the subgenus Neurocarpum are 4-8 mm wide (except C. simplicifolia, C. laurifolia, and C. falcata, all (6) 7-11 mm wide). Species of the subgenus Clitoria are divided between these two sizes. The smallest calyx tube throat width is 3-4 mm in C. heterophylla. Calyx tube widths at the calyx base are typically 2-8 mm, and show no apparent distinct patterns of variation. The base width is distinctly large in C. plumosa (8-10 mm).

Typical calyx pubescence is composed of microscopic, uncinata trichomes with a few, short, appressed macro-trichomes, or less commonly erect. A glabrous calyx (which may sometimes bear widely scattered uncinata trichomes) occurs only in C. amazonum and C. glaberrima. Densely silky trichomes occur only in section Flexuosa (subgenus Bractearia). Long reddish, shaggy trichomes, highly conspicuous to the eye, occur in C. plumosa. A dense mat of puberulous hairs and some uncinata trichomes occur in C. dendrina, C. brachycalyx and C. brachystegia.

#### Vexillum

The vexillum is complicate, large and U-shaped when expanded, erect, obovate to orbicular, more or less emarginate, usually large and showy, short-clawed, appendageless, with the pigmentation of the inner surface darker towards periphery and light-colored center with veins

prominately darker-colored, converging into the throat, and is pubescent on the outer surface, often minutely ciliolate near apex.

The vexillum of Clitoria is similar to those that are described in other members of the Glycineae, although usually larger. A few genera bear auricled appendages and Centrosema is unique in possessing a spur. Centrosema also differs from Clitoria by having an incurved claw. Yet the similarity in appearance of the vexillum apparently is confusing to some botanists (e.g., the large number of generic misidentifications despite the incurved claw and spur of Centrosema). When open, the Clitoria vexillum forms a narrow "U-shaped" to broad "V-shaped" platform with an open throat, the alae and carina elevated above the vexillum surface. Each half of the vexillum is concave on its inner face. The Centrosema vexillum forms a narrow "V-shaped" platform with the lateral edges reflexed outward. The throat is closed as the alae and carina are in close contact with the vexillum surface. Each half of the vexillum is convex on its inner face, weakly so near the base where the halves join and strongly so near the apex.

The size of the vexillum correlates with the flower size discussed previously. The length of the claw is typically 4-8 mm in small flowers (except C. heterophylla, C. biflora and C. australis, 1-3 mm) and medium-sized flowers of subgenera Neurocarpum and Clitoria. Medium-sized flowers of the subgenus Bractearia and some large-sized flowers are 8-12 mm with some large flowers possessing claws of variable lengths to 20 mm (C. amazonum, C. javitensis, C. densiflora). The claws are typically 1-5 (8) mm in the subgenus Clitoria, 4-12 mm in the subgenus Neurocarpum (except C. densiflora, 16-20 mm, and C. australis, 2-3 mm), and variable in the subgenus Bractearia.

The pubescence is of very dense, short, appressed trichomes in half the species of subgenera Bractearia and Neurocarpum. In Bractearia, the silky appearance of the vexillum is associated with species exhibiting arboreal and tall, erect shrub habits. In Neurocarpum, no pattern is evident. The second typical pubescent type consists of uncinat trichomes with a few, scattered, macrotrichomes. This type of pubescence is generally associated with the liana species of subgenus Bractearia. There is no evident pattern in subgenus Neurocarpum, although all species of the subgenus Clitoria possess this pubescent type.

#### Alae

The alae are oblong to oblong-falcate, spatulate, shorter than the vexillum, long-clawed, adherent in the middle of its blade to the carina, and extending beyond the carina.

The size of the blade, claw, and distance the alae extend beyond the carina are highly variable. No correlation with subgeneric lines nor with flower size can be drawn. The closest pattern observed was that the alae extended past the carina: 3-6 mm in small flowers (except C. cordobensis, 8-9 mm); 5-8 mm in medium-sized flowers (except C. brachystegia, American members of C. mariana, C. ternatea, and C. lasciva, 6-12 mm; and in C. leptostachya, 3-4 mm); and 7-13 mm in large flowers (except C. pendens, 4-6 mm, and C. epetiolata, 13-15 mm).

The alae blade of most species is 12-30 mm long with variable widths. Six species have shorter blades, 7-12 mm, while only C. plumosa has an elongated blade (30-35 mm). The blade width forms a continuous gradient, although most species of subgenus Bractearia have a width of 5-12 mm while most species of subgenus Neurocarpum have a

width of 3-8 mm. The claws are variable, although most species of subgenus Bractearia have a claw length of 10-25 mm (C. amazonum, 26-33 mm), whereas those species of subgenera Neurocarpum and Clitoria are 8-15 mm.

### Carina

The carina is subfalcate to falcate, incurved, acute, shorter than the alae to which it adheres, and long-clawed.

The size of the carina blade and claw form a pattern associated with flower size, not subgeneric lines. The measurements form a continuum with a distinct break between large flowers and small flowers. Medium-sized flowers overlap the lower dimensions of large flowers and larger dimensions of the small flowers. The carina blade is 10-20 mm long in large flowers, 5-10 mm long in small flowers (except C. brachycalyx, 10-14 mm), and 7-15 mm long in medium-sized flowers. The carina blade is 4-8 mm wide in large flowers, 2-4 mm wide in small flowers (4-5 mm in C. nervosa, C. glaberrima and C. brachycalyx) and 3-6 mm wide in medium-sized flowers. The claw is 2-4 cm in large flowers, 1-2 cm in small flowers, and 1-2 cm in medium-sized flowers of subgenera Neurocarpum and Clitoria and 2-3 cm in medium-sized flowers of subgenus Bractearia (except C. fairchildiana, 1.5-2.5 cm).

### Androecium

The androecium is diadelphous, persistent in fruit, with the vexillary stamen free or occasionally coherent below and easily separated. The staminal tube is glabrous, straight to weakly arcuate and incurved at tip. The free filaments are filiform. The anthers are uniform and basifixed.

The stamens are similar to those of the other genera in the Glycineae. A unique stamen arrangement occurs in the double-flowered variety of C. ternatea. The stamens are all free, a primitive condition rare in the Fabaceae, or the stamens are subpolyadelphus, with some stamens free and others coherent in 1-3 bundles of 2-3 stamens near their base.

The length of the staminal tube is highly variable and correlates somewhat with flower size. Large flowers have a staminal tube 3-5 cm long, whereas small flowers have a tube 1-2.5 cm long. Medium-sized flowers have variable tube lengths, but those species in subgenus Bractearia are 2.5-4 cm long, those species in the subgenus Neurocarpum slightly shorter at 2-3 cm, and those species in subgenus Clitoria are 1-2 cm long. In general, species of subgenus Bractearia are mostly 25-42 mm long, whereas those in Neurocarpum are mostly 14-23 mm, with each subgenus having a few species in the size range of the other subgenus. Subgenus Clitoria has tubes 10-20 mm long with C. heterophylla possessing a short tube of 8-10 mm. Extremely long tubes are found in C. pozuzoensis, C. pendens, C. obidensis and C. plumosa (40-55 mm).

The length of the free filaments forms a continuum from 1-7 mm and shows no patterns in the variation.

The anthers are consistent in size, typically 1-2 mm long and 0.5-0.8 mm wide. Six species in subgenus Bractearia possess anthers 2-3 mm long, all lianas except the shrub C. amazonum. Several species of each subgenus have anthers 0.7-1.0 mm wide.

Uncinate trichomes appear near the apex of the staminal tube in a few species of subgenus Bractearia. The trichomes occur in

C. nervosa, C. andrei, C. arborescens, and in some members of C. dendrina and C. brachycalyx.

#### Gynoecium

The gynoecium is enclosed within the staminal tube. The ovary is stipitate, linear, compressed, many-ovuled, and densely pubescent. The style is elongated, twisted, geniculate near the tip, dilated above the geniculate point, and conspicuously bearded lengthwise from near ovary to the stigma. The style base is persistent in fruit. The gynophore is subsessile to long, usually densely uncinata. The stigma is capitate, often short-pubescent at its base.

The key characteristic that segregates Clitoria from all other genera of the Glycineae is the geniculate, bearded style. Sometimes the style of Centrosema is described as bearded at the apex, but the trichomes are short and congregated below the stigma, never found through the entire length of the style. In Clitoria, the trichomes are short to long, dense, originating mostly from the margins of the flattened style, and extending the entire length. The "beard" has often shorter, less conspicuous trichomes below the point of geniculation.

The ovary has two distinct pubescent types. Some are densely uncinata, becoming scattered on the legume valves or glabrous. Other ovaries may bear uncinata hairs, but are masked by short to long, densely appressed, white to yellowish-white trichomes. These hairs may be retained or lost in fruit. The gynophore has a pubescence similar to the ovary near its apex and is uncinata to glabrate at its base.

The length of the gynophore fits no distinct pattern of variation, although species in the subgenus Clitoria usually have a subsessile



ovary, the gynophore being 1-1.5 mm long. Those gynophores in the other species are 1-8 mm with the gynophore elongated in C. pendens (8-13 mm).

Ovary variation correlates along subgeneric lines. Those species in the subgenus Bractearia have ovaries 10-20 mm long, whereas those species in the subgenera Neurocarpum and Clitoria have ovaries 5-9 mm long (except C. ternatea with 10-13 mm). The ovary is elongated in C. amazonum (28-32 mm long). The width of the ovary is usually 1-2 mm wide in subgenera Bractearia and Clitoria, whereas the ovary in subgenus Neurocarpum is 0.7-1.0 mm wide.

Variation in style length does not seem to correlate with subgeneric lines nor flower size. The majority of species have styles 10-21 mm long, while several species in the subgenera Bractearia and Neurocarpum have styles to 35 mm long. The style length above the geniculation point varies from 4-14 mm, the variation seemingly not forming any pattern.

#### Observations

The chasmogamous flower is often glued to the herbarium sheet. It is usually mounted on the herbarium sheet in the complicate (i.e., folded) position. Few flowers accompany collections of species in the subgenera Clitoria and Neurocarpum in packets, as is the case more frequently in subgenus Bractearia. Thus internal examination and measurement of the flower structures become difficult without destruction of the flower. This author offers the following suggestions for the examination of dried flowers with minimal damage to the material. First, avoid opening the flower at all, and make measurements from the outside. The calyx persists in fruit and can be

measured at any time, although it is best to measure those of subgenus Clitoria in flower as the subpellucid calyx shrinks in fruit. Staminal tubes are best measured in fruit as they are persistent, project above the calyx, and shrink slightly. In early fruiting stages, the petals are often absent and one can find the filaments still attached and occasionally with an anther. The base of the staminal tube (and claw attachments for the petals) can be determined from the outside. The abrupt widening of the calyx at its base indicates the internal disc to which these structures are attached. The carina blade often forms an impression in the vexillum which can be easily observed and measured. The style can be measured in specimens with immatured fruits. Second, when necessary, use a needle probe and carefully tease the vexillum halves apart. Pick another flower when resistance is met, as pressure applied against the resistance will tear the vexillum. By using forceps or a probe to gently hold the vexillum halves apart, one can measure the alae and carina blades, and measure the claws down to the swollen calyx base (=disc area). If necessary, one can gently tease the carina blades apart from the base to examine the androecium and gynoecium, although one must dissect the calyx to observe the ovary and gynophore. Third, place the flower contents into protective packets when dissected, and affix the packets to the herbarium sheets. Glasseine envelopes were used in this study for dissected floral parts, for both the flowers this author dissected and for the loose floral parts this author found in packets. Dissection need not occur, however, for most floral structures; the open vexillum can be reclosed with a slight pressure, and the parts preserved. This author has tried an alternative method suggested by others on locally collected, pressed

Clitoria flowers. This method entailed the removal of the flower from the specimen, placing it in water to moisten the petals, partially drying the flower to remove most excess water, then dissection of the floral parts. This method is not recommended as it leads to more destruction than the method this author suggested above.

A number of flower structures showed patterns of variation along subgeneric lines and correlated with flower size. The variations are summarized in Tables 4 and 5. Those characters which correlate with flower size are best used to segregate small groups of species. Those characters which correlate with the subgenera are best used as supportive data since measurements often overlap or the character could be misinterpreted. These characters may be useful in segregating groups of species into sections. In the descriptions, measurements of those structures that are more difficult to view without flower dissection (e.g., ovary, gynophore), may be less reliable as fewer measurements were made, especially in species of one to few collections. However, measurements were highly consistent in those species with larger collections of flowering material.

Flower color is somewhat unreliable as only a small number of species descriptions include references to color, and these typically reflect the color observed in the field which can be interpreted differently by each collector. Pale blue, lilac, and rose to pink shades dried to various shades, sometimes appearing blue to lilac-shaded, and at other times appearing a darkened dull-yellow to orangish-yellow. White flowers appear unpigmented in the dried state, or sometimes darkened, and sometimes they dry between a pale to a bright yellow shade.

Table 4. Comparison of flower structures by subgenera. Variation patterns of these characters correlate along subgeneric lines. All characters refer to chasmogamous flowers with the exception of the character "cleistogamy."

CHARACTER	BRACTEARIA	CLITORIA	NEUROCARPUM
Calyx nerves	Numerous	10-nerved	10-nerved (numerous)
Calyx texture	Subcoriaceous	Subpellucid	Cartilaginous
Calyx shrinkage	Retains size in fruit	Shrink in fruit	Retains size in fruit
Calyx lobes	Generally 3-7 mm (7-12)(13-18)(20-27)	3-7 mm or 7-12 mm	Generally 7-12 mm (3-7)
Calyx tube width throat	Generally 7-13 mm (1 spp. = 5-8 mm)	4-8 mm and 7-13 mm	Generally 4-8 mm (3 spp. = 6-11 mm)
Alae blade width	Generally 5-12 mm	7-13 mm or 3-6 mm	Generally 3-8 mm
Alae claw length	10-25 (33) mm	8-15 mm	8-15 mm
Staminal tube	2.5-4 cm	1-2 cm	1.4-2.3 mm
Ovary length	10-20 mm	5-9 mm (1 sp. = 10-13)	5-9 mm
Cleistogamy	Absent	Absent	Present or Absent

Table 5. Comparison of flower structures by flower size. Variation patterns of these characters cut across subgeneric lines except where indicated. (B = Bractearia; N = Neurocarpum; C = Clitoria).

CHARACTER	LARGE FLOWERS	MEDIUM-SIZED FLOWERS	SMALL FLOWERS
Subgeneric size:			
Bractearia (B)	6-8 (9.5) cm	4-6 cm	2-4 cm
Neurocarpum (N)	5.5-7.5 (8) cm	3.5-5.5 cm	2-3.5 (4) cm
Clitoria (C)	Absent (1 sp.-lasciva)	3.5-5.5 cm	2-3.5 (4) cm
Composite size	5.5-8 (9.5) cm	3.5-6 cm	2-4 cm
Flower color	Blue, violet, pink, lilac (rarely white)	Blue, violet, pink, lilac (rarely white)	White (rarely pigmented)
Calyx tube length	15-25 mm	13-20 mm (B) 7-16 mm (C,N)	4-8 mm
Total calyx length (Tube + lobes)	2-4 (5) cm	1-3 cm	1-3 cm
Calyx tube width (at throat)	8-13 mm	8-13 mm or 5-8 mm	3-6 mm
Vexillum claw	8-12 (20) mm	4-8 mm (C,N) 8-12 mm (B)	4-8 mm (1-3)
Carina length	10-20 mm	7-15 mm	5-10 mm
Carina width	4-8 mm	3-6 mm	2-4 mm

Table 5 - continued

CHARACTER	LARGE FLOWERS	MEDIUM-SIZED FLOWERS	SMALL FLOWERS
Carina claw	2-4 cm	1-2 cm (C,N) 1.5-2.5 cm (B)	1-2 cm
Staminal tube	3-5 cm	2.5-4 cm (B); 2-3 cm (N) 1-2 cm (C)	1-2.5 cm

### Cleistogamous Flowers

Cleistogamous flowers are small, inconspicuous, apetalous, or sometimes retaining minute, translucent vestiges within the calyx. These flowers are self-pollinated. Cleistogamous flowers are rarely reported for the genus, and are known in literature (Harms, 1907; Burkart, 1941) from only five species. Ample examination of herbarium collections has revealed that such flowers are confined to eleven species in the subgenus Neurocarpum. These species occur in dry habitats of the Americas. Two of these species (C. falcata and C. laurifolia) have been introduced into and naturalized in Africa and Southeast Asia-Indonesia. Cleistogamous flowers which occur in the American variety of C. mariana are absent from the Asian variety. Cleistogamous flowers may occur on a plant at the same time as chasmogamous flowers (chasmocleistogamy), but usually the plant specimens are collected with only the cleistogamous flowers, and these are usually in various stages of fruiting. A generalized cleistogamous flower is illustrated in Figure 6. Cleistogamous flowering and fruiting structures are summarized by species in Table 6.

In general, the inflorescence, bracts, bracteoles, fruits, and seeds are similar to the chasmogamous structures, although sometimes of smaller sizes. Their morphology will not be reiterated here. The calyx, corolla, androecium and gynoecium exhibit marked differences and will be included.

#### Calyx

The calyx is much smaller than the chasmogamous calyx, narrowly infundibular-tubular, persistent in fruit, conspicuously nerved, and

Figure 6. Generalized cleistogamous flower. (a) cleistogamous flower, longitudinal section, x 5; (b) gynoecium, x 8; (c) androecium, x 3; (d) cleistogamous flower, x 3; (e) cleistogamous flower with juvenile fruit, x 3; (f) cleistogamous flower with mature fruit, x 3; (g) translucent vestigial petals, x 15.





a



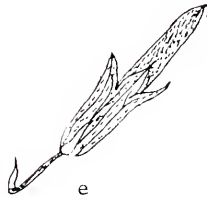
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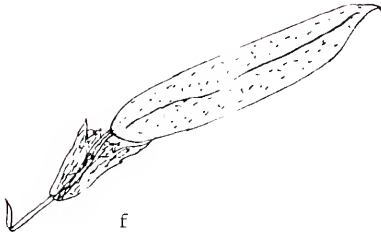
c



d



e



f



g

Table 6. Comparison of cleistogamous structures by species.

SPECIES	BRACTS	BRACTEOLAS	CALYX TUBE	CALYX LOBES	GYNOPHORE	OVARY	STYLE
<u>polystachya</u>	2-3 mm	3-4 mm	4-6 mm	2-3 mm	1 mm	6 mm	3-4 mm
<u>mexicana</u>	2-3 mm	3-5 mm	4-7 mm	2-4 mm	1 mm	5 mm	3-5 mm
<u>monticola</u>	2 mm	3 mm	4-5 mm	1.5-2 mm	1 mm	5 mm	4 mm
<u>mariana (Amer.)</u>	2-3 mm	3-5 mm	4-5 mm	2-3 mm	1 mm	4-5 mm	4-6 mm
<u>fragrans</u>	2 mm	2-3 mm	3-4 mm	2-3 mm	1-2 mm	4 mm	5-6 mm
<u>cordobensis</u>	4-5 mm	4-5 mm	5-6 mm	2-3 mm	1.5-2 mm	3-4 mm	3-4 mm
<u>falcata</u>	3-4 mm	4-7 mm	5-8 mm	4-7 mm	1 mm	4-5 mm	3-4 mm
<u>guianensis</u>	3-7 mm	3-7 mm	4-8 mm	3-4 mm	2-3 mm	4-5 mm	5-6 mm
<u>V. macrocleistogamous</u>	5-6 mm	5-7 mm	10-11 mm	4-6 mm	?	?	?
<u>epetiolata</u>	4-5 mm	5-7 mm	6-9 mm	4-6 mm	2 mm	6 mm	5 mm
<u>nana</u>	1.5-3 mm	4-5 mm	6-7 mm	5-6 mm	3 mm	5 mm	4 mm
<u>laurifolia</u>	2-4 mm	3-5 mm	5-7 mm	2-4 mm	1.5-2 mm	3-4 mm	3-4 mm

Table 6 - continued

SPECIES	STAMINAL TUBE	FREE FILAMENTS	STIPE	COSTA	LEGUME LENGTH	LEGUME WIDTH
<u>polystachya</u>	4-5 mm	1.5-2 mm	6-7 mm	-	2.5-4 cm	7-8 mm
<u>mexicana</u>	4-5 mm	1-1.5 mm	6-7 mm	-	2-4 cm	6-7 mm
<u>monticola</u>	4-5 mm	0.5-1 mm	6-7 mm	-	2.5-3 cm	5-7 mm
<u>mariana</u> (Aner.)	0.1 mm	1-3 mm	5-10 mm	-	3-4 cm	6-8 mm
<u>fragrans</u>	0.1 mm	1-2 mm	9-14 mm	-	2-4 cm	6-8 mm
<u>cordobensis</u>	3-4 mm	1-1.5 mm	8-16 mm	-	2-4.5 cm	3-6 mm
<u>falcata</u>	0.5 mm	3-4 mm	6-12 mm	+	2.5-4.5 cm	7-11 mm
<u>guyanensis</u>	0.5 mm	3-4 mm	8-14 mm	+(-)	2.5-5 cm	7-11 mm
<u>v. macrocleistodamous</u>	0.5 mm	4 mm	16-18 mm	+	4-4.5 cm	8-11 mm
<u>epetiolata</u>	0.5 mm	2-4 mm	8-12 mm	-	3-6 cm	8-11 mm
<u>nana</u>	0.5 mm	2-3 mm	7-9 mm	-	3.5-4.5 cm	7-9 mm
<u>laurifolia</u>	0.5-1.5 mm	1.5-2 mm	6-13 mm	+	2.5-4.5 cm	8-11 mm

with its apex five-lobed, shorter than the tube, upper lobes subconnate, lowermost lobe narrower, and subequal to slightly longer. The calyx has the appearance of a narrow tube, although the width at the throat (2-4 mm) usually is double the basal width (1-2 mm) where the internal disc is located and to which the androecium and petals are attached.

The calyx is inconspicuous, the tube usually 4-8 mm long, the lobes 2-6 mm long. This is quite in contrast with the chasmogamous flowers of these species which have tubes of 8-23 mm long and lobes of 4-15 mm.

#### Corolla

The petals are variable, often absent, sometimes present as vestigial remnants, whitish-transparent, minute, more or less clawed. Petal number varies from 1-5; petals usually are 1 mm long, sometimes to 2-3 mm, erect, similar in shape, with a short claw and oblong blade. Petals may be present or absent in flowers on the same plant.

#### Androecium

The filaments are sessile or connate in a short tube, diadelphous, and enclosed within the calyx tube. The anthers are similar to those of chasmogamous flowers. The staminal tube has more variation than other cleistogamous structures. Two species appear to have free filaments as the basal tube is highly reduced, circa 0.1 mm long. Five species have sessile tubes, circa 0.5 mm long, with one of these species having a tube 0.5-1.5 mm long. Four species have conspicuous staminal tubes, although short, at 3-5 mm. The staminal tubes and filaments are persistent in fruit, but hidden by the calyx

tube. The anthers often detach and adhere to the ovary as it is developing into the fruit.

#### Gynoecium

The ovary is enclosed in the calyx tube and similar to the chasmogamous ovary in pubescence and width, but shorter, stipitate to subsessile, with the style abruptly bent back toward the ovary at its base. The stigma is often in contact with the anthers. Gynophores are usually 1-2 (3) mm. Ovaries are 3-6 mm long, 0.7-1 mm wide. Styles are 3-6 mm long, but may be longer or shorter than the ovary, even though the range of variation agrees with the range of variation for the ovary.

#### Observations

Cleistogamous flowers are known from collections that are predominantly in fruit or with chasmogamous flowers. Because of their inconspicuous size and the general lack of collections with only cleistogamous flowers, one can presume that in most cases the collector was unaware of the presence of the cleistogamous flowers and collected the plant because of its showy chasmogamous flowers or its fruit. Some closely related species (e.g., C. triflora, C. simplicifolia) lack collections with cleistogamous flowers. Plants bearing cleistogamous flowers should be searched for and reported in these related species.

Cleistogamous structures are unreliable characters for segregation as the range of variation is too similar to those of other species. Where there are some distinctions, these may be used as weak supportive characters for segregation. An exception would be the length of the staminal tube, which seemingly is consistent among the flowers

examined within a species, and whose length correlated into three distinct groups (subsessile=0.1 mm; short=0.5-1.5 mm; long=3-5 mm).

It is important to note that in several species (e.g., C. polystachya, C. mexicana, C. monticola, C. cordobensis, C. nana, C. epetiolata), the quantity of cleistogamous collections is low, limiting the number of cleistogamous flowers examined. In addition, some structures (e.g., gynophore, ovary) were rarely seen. The range of variation for some structures is thus questionable and subject to expansion with further data.

### Legume

The legume is stipitate, rarely sessile, linear, compressed and ecostate, more or less sometimes raised around the seeds, or less commonly turgid and costate, becoming tetragonous. The valves are flat or convex, slightly thickened on the upper or on both sutures, often bearing uncinat trichomes, and usually beaked by the persistent style base. Dehiscence occurs by a splitting along the sutures followed by a spiral twisting of the valves. Legumes are similar to those of other species in the Glycineae with only the genus Centrosema (two-nerved near the margins) and some members of the genus Clitoria (one lateral nerve) costate.

The legume is one of the major structures used for segregation of the species into subgenera. Three basic morphological types occur with a fourth intermediate type found in two subgenera. Fruits of subgenus Bractearia are long-stipitate, compressed, ecostate, with the valves thickened on the sutures, flat, and very large in size. In some members, the pod becomes weakly turgid around the seeds and depressed

between the seeds. These fruits are referred to as "lomentaceous"<sup>1</sup> in this study, a term based upon Dayton and Jackson (1928). Fruits of subgenus Clitoria are subsessile, compressed, ecostate, with the valves flat, slightly thickened on the sutures, intermediate in size, and its base is enclosed within the calyx. Fruits of subgenus Neurocarpum are short-stipitate, compressed and ecostate, or costate and turgid, subtetragonous at maturity. Valves are convex, slightly thickened on the sutures, with the base elevated above the calyx or enclosed within it. Some members have lomentaceous legumes. Fruit and seed characters are summarized by subgenus in Table 7. A generalized fruit and representative seeds are illustrated in Figure 7.

#### Stipe

The stipe is mostly enclosed within the persistent calyx, longitudinally striated, more or less uncinat pubescent, sometimes bearing macroscopic trichomes near its apex, and persistent after fruit dehiscence and abortion of the valves. It is usually slender, lignose, abruptly expanding at the apex to form a shallow concavity upon which the legume base sits.

Stipe length is variable. In the subgenus Bractearia, the stipe is elongated, exerted from the calyx, typically 12-33 mm long. A shortened stipe (10-12 mm) occurs in C. glaberrima. Highly elongated stipes occur in C. amazonum (25-50 mm), C. brachycalyx (28-45 mm), C. pozuzoensis (34-35 mm), and C. flexuosa (39-40 mm). The latter two

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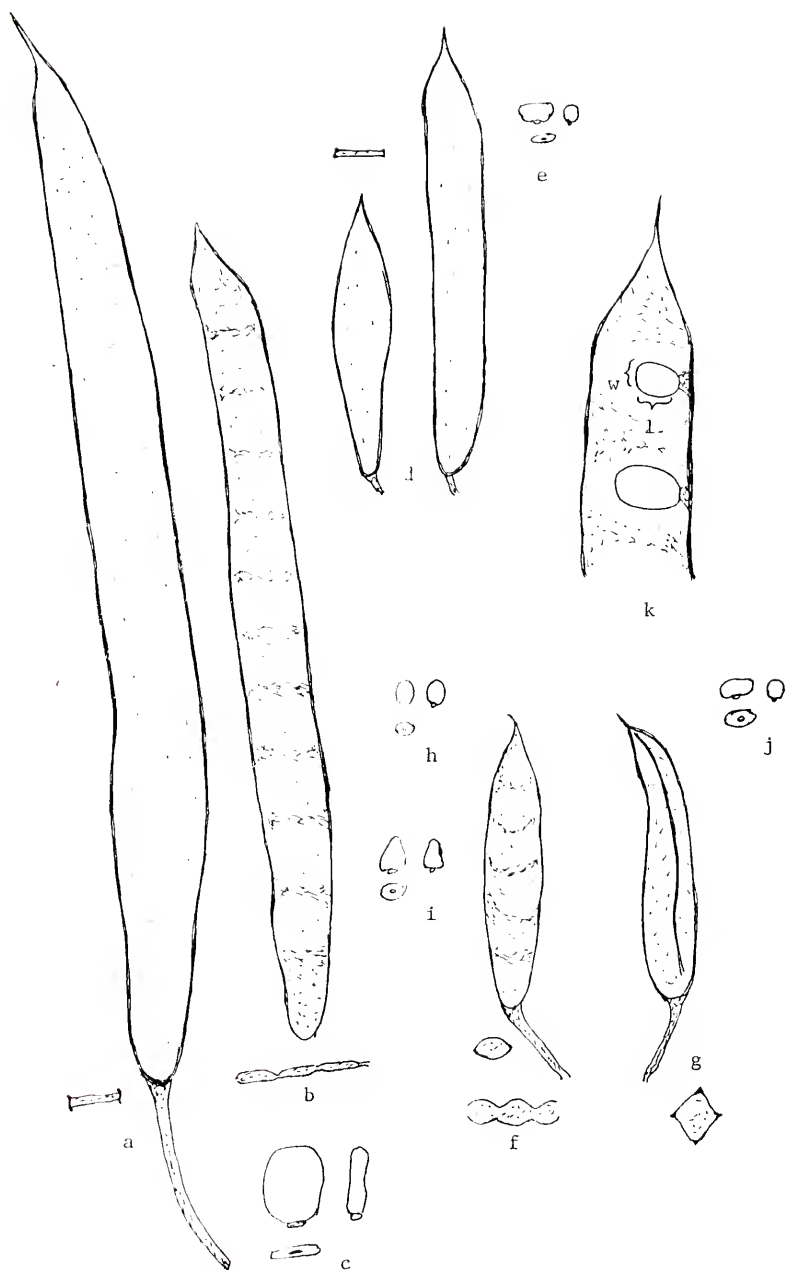
1. Lomentaceous legume: a type of legume which superficially resembles loment in that the valve is contracted between the seeds transversely to seemingly appear to be a segmented fruit, but whose dehiscence occurs by a longitudinal splitting along the sutures, typical of a legume.

Table 7. Comparison of fruits and seeds by subgenera.

CHARACTER	BRACEARIA	CLITORIA	NEUROCARPUM
Stipe	Long; 12-33 (50) mm	Subsessile; 1-4 mm	Short; 4-14 mm
Valve length	(7) 10-30 cm	7-11 cm or 2-5 cm	3-6 (7) cm
Valve width	10-40 mm	(4) 8-15 mm	6-11 (13) mm
Valve curvature	Flat	Flat	Convex
Valve nerves	Ecostate	Ecostate	Ecostate or costate
Valve base	Exserted	Enclosed by calyx	Exserted or enclosed
Dehiscence	1/4-1 (2-4)	1-2 turns	1/4-2 turns
Lomentaceous legume	+ or -	-	+ or -
Seed coat	Smooth	Smooth	Viscid
Seed shape	Orbicular	Subreniform	Subreniform (Orbicular: ovoid)
Seed length	7-13 (17) mm	2-4 mm	3-5 (6) mm
Seed width	7-13 (16) mm	4-6 (8) mm	3-6 mm
Seed thickness	Flat (1-3 mm) Turgid centers (3-5 mm)	Flat (1-2 mm)	Turgid (3-4 mm)
Seed germination	Epigeal	Epigeal	Hypogeal



Figure 7. Generalized legumes and seeds. Subgenus Bractearia: (a) flat legume, with cross section illustrated; (b) sublomentaceous legume, flat, depressed between seeds, portion of longitudinal section illustrated; (c) three views of typical seed. Subgenus Clitoria: (d) legumes, with cross section illustrated; (e) three views of typical seed. Subgenus Neurocarpum: (f) ecostate, lomentaceous legume, with portion of longitudinal section illustrated; (g) costate, subtetragonus legume, with cross section of turgid legume illustrated; (h-j) three views of different types of viscid seeds occurring within subgenus. Generalized longitudinal section of legume; (k) view of inner face with seeds attached; (l) length of seed as defined in this study; (w) width of seed as defined in this study.



species have rarely been collected in fruit, and may have greater range of variation. Within the typical range of length, species tend to be either 12-22 mm long or 23-33 mm. In the subgenus Clitoria, the stipe is subsessile, 1-2 mm long. Stipes are variable in length in subgenus Neurocarpum, but typically 4-14 mm. Species tend to be either 4-8 mm long or 6-12 (14) mm. Elongated stipes occur in the American variety of C. mariana (12-17 mm) and C. fragrans (15-21 mm).

The stipes are typically 1-3 mm thick and rapidly expanding to 3-7 mm wide at the apex. In the very large fruits of some members of the subgenus Bractearia the stipe is typically 3-5 mm thick and expanded to 6-10 mm wide at the apex, as in C. arborea and C. nervosa.

Valves

The size of the legume valves is variable. In general, fruits of the subgenus Bractearia are large, those of the subgenus Neurocarpum are small, and those of the subgenus Clitoria are of intermediate size. The fruits of the subgenus Bractearia are 10-30 cm long and 1-4 cm wide. Shorter fruits occur in C. coriacea (6-12 cm), C. obidensis (7-9 cm) and C. kaeteurensis (8-13 cm). The fruits are typically 1-2 cm wide with those 2-4 cm wide associated with the primitive bracteoles, such as C. arborea (2.3-4 cm), C. fairchildiana (2.2-3.3 cm) and C. juinensis (2.5-3.2 cm). Often these latter fruits have thickened sutures, almost thick winged-like. The fruits of C. brachycalyx (1.6-3 cm) are not associated with the primitive bracteoles, an exception to this generalization. The fruits of subgenus Neurocarpum are typically small, with a length of 3-6 (7) cm and a width of 6-11 (13) mm. Most of the species have fruits that span the measurement ranges, whereas fruits with a more restricted range of

variation are found in species of a few collections. The fruits of several species in both of these subgenera are unknown, but their size is expected to correlate with those species of close relationship (e.g., fruits of C. andrei should correlate with those of C. juinensis when collected). The fruits of the subgenus Clitoria are intermediate in size. Longer fruits of 7-11 cm belong to C. lasciva and C. ternatea, with the other species correlating with Neurocarpum species. The width of the valves agrees with Neurocarpum species except for C. kaessneri (1-1.5 cm).

Valves are flat in the subgenera Bractearia and Clitoria whereas those of Neurocarpum are convex. In fruits associated with the primitive bracteoles, valves are thick coriaceous with prominently raised striations. They are less prominent in other species of the subgenus Bractearia and in the subgenus Neurocarpum. Veins in the subgenus Clitoria are slightly dark-colored, with the striations impressed to subimpressed, not prominently raised. These striations are densely packed, often forming transverse diagonal lines with some connecting striations.

In some species of the subgenera Bractearia and Neurocarpum, valves become conspicuously raised around the seeds and depressed between them, sublomentaceous to lomentaceous. The surface is flattened in the former subgenus and convex in the latter subgenus. Sublomentaceous fruits are associated with the short calyx tube in the subgenus Bractearia (section Brachycalyx). In Neurocarpum species, this fruit type is associated with the Mexican, United States, and Southeast Asian members.

Some species of the subgenus Neurocarpum develop fruits which have a conspicuously raised, prominent, lateral nerve. Mature fruits become subtetragonous. This unique character is rare in the Fabaceae. Costate fruits were historically considered worthy of generic recognition, thus this one character led to the establishment of the genera Martia and Neurocarpum as segregated from Clitoria. Bentham (1858) noted a breakdown in this character, and correctly combined these two genera with Clitoria. The costate fruit is prominent in a number of South American, Central American, and Caribbean members. A number of specimens, particularly in the species C. guianensis and C. falcata have incomplete nerves. The nerve when completely formed, extends one-third to three-fourths the length of the fruit. Both costate and ecostate fruits may occur on the same plant. An incomplete costa is prominently raised at one end, and rapidly submerges into the surface near the other end. Costate fruits are sometimes mistaken for those fruits found in the genus Canavalia (cf. Fantz, 1976, and C. javitensis, p. 385), but this genus can easily be distinguished from Clitoria by its nonresupinate flowers and unique calyx (cf. Sauer, 1964).

The dehiscence of the fruits is variable in the number of spiral twists that occur. In general, most species have one-fourth of a turn to two spiral turns with greater twisting in C. leptostachya (2.5-3 turns) and C. brachystegia (3-4 turns). In several species, no dehiscent fruits were observed. Those species with known fruits were evenly split between those of 0.25-1 turn and those of 1-2 turns. This character is more descriptive than diagnostic.

Fruits from cleistogamous flowers occur only in the subgenus Neurocarpum. They correlate with the fruits from chasmogamous flowers except that the size is sometimes smaller.

#### Observations

Although a number of species have yet to be collected in fruit, the fruits and seeds are major diagnostic characters for the segregation of the subgenera. Leaves, habit, inflorescences, seed germination and cytology all provide supportive data for this segregation. Those species without known fruits can be placed subgenerically largely by the supportive data.

One has to be particularly careful of the fruits of liana species. A number of specimens had Clitoria flowers with non-Clitoria fruits. The fruits were nearly always separate. Those connected were generally leafless branches, but inflorescence, bracteoles, calyx, and other characters distinguished them from Clitoria. It is presumed that the collector inadvertently collected two lianas thinking that they were the same plant, or picked the fruit off the ground with reason to believe that they dropped from the liana. Mixed collections with Clitoria flowering branches and non-Clitoria fruiting specimens were conspicuously frequent in Suriname collections.

#### Seeds

Seeds are dark reddish-brown to black, orbicular to subreniform, sometimes oblong, compressed or thickened, glabrous. The seed coat is smooth or viscid. Seeds are somewhat variable, but reliable as diagnostic characters for subgeneric delineation. Seeds of the subgenus Bractearia are large, smooth, orbicular to oblong, flat to

lenticular. Seeds of the subgenus Clitoria are small, smooth, subreniform, flattened. Seeds of the subgenus Neurocarpum are small, viscid, orbicular-oblong to subreniform, thickened.

Seed color is variable in a number of species. Both reddish-brown and black seeds are found in the same specimen. Sometimes darkened reddish-brown seeds with black spotting to blotching occur. Some seeds are reddish-black. Where both colors occur in a species, the black seeds are usually larger and seemingly more mature. This suggests a continuum where the seeds are brownish, darkening upon maturity and appearing black. Seed color is a descriptive character, but not reliable as a diagnostic character.

Seed size is reliable along subgeneric lines. Large seeds occur in the subgenus Bractearia, whereas small seeds are found in the subgenera Clitoria and Neurocarpum. Since the longer axis can occur in two directions, measurements taken and labeled "length" were in the same direction as the funiculus, whereas those labeled "width" were perpendicular to the funiculus. Seeds in the subgenus Bractearia were 7-13 (17) mm long and 7-13 (16) mm wide. Most seeds were orbicular to subquadrate with rounded corners, flat to lenticularly thickened, with both dimensions subequal. Orbicular-oblong to oblong seeds occurred in several species with the length being the larger dimension. The smallest seeds (6-8 mm, orbicular) occurred in C. sagotii and C. obidensis. Seeds with larger dimensions (length 11-17 mm; width 10-15 mm) occurred in C. arborea, C. fairchildiana and C. pozuzoensis with the latter oblong (width 10-12 mm). Seeds in the subgenus Clitoria are small, 2-4 (6) mm long, (3) 4-8 mm wide. All are subreniform with the width being the longest axis. The widest seeds

(6-8 mm) occur in C. lasciya and C. kaessneri with the latter having the longer seeds (6 mm). The smallest seeds belong to C. heterophylla (length 2-3 mm; width 3-5 mm). The seeds of subgenus Neurocarpum are small, thickened, subreniform with the width slightly longer than the length. They are typically 3-5 mm long and 4-6 mm wide. The thickness is typically 3 mm, almost as large as the other dimensions, giving the seeds a cuboidal-rectangular shape. In a few species (e.g., C. guianensis, C. epetiolata), the seeds are orbicular-oblong with the length the slightly longer axis (length 3-5.5 mm; width 3-4 mm), and with the thickness appear globular. In the species C. stipularis and C. densiflora, the seeds appear ovoid as the length is longer and the width is slightly longer than the thickness (length 4-6 mm; width 3.5-4.5 mm; thickness 3-4 mm).

The seed coat is viscid in subgenus Neurocarpum and smooth in the subgenera Bractearia and Clitoria. The sticky coat is conspicuous when the seed adheres to an herbarium sheet, packet, or to plant parts. When the sticky fluid solidifies, it produces a shinier, glassy coat around the seed, similar to the solidification of a caramel apple's sugary coat. The smooth seed coat is dull, non-glassy, and scratch marks are left when it is scraped with a needle probe. The viscid coat around the seed will shatter into various sized plates around the site of probing. The sticky nature of the coat will persist for a number of years as specimens from the early 1950's (ca 25 years) were observed to still be sticky. Occasionally older seeds are found in this condition.

The number of seeds that occur per legume is variable, although most species produce fruits with 4-12 seeds. A few species produce few-seeded fruits, such as C. biflora (2-4 seeds) and C. kaessneri



(1-3 seeds) of the subgenus Clitoria and C. polystachya (1-5 seeds), C. hanceana (2-6 seeds), and the Asia variety of C. mariana (1-4 seeds) of subgenus Neurocarpum. Most species in these two subgenera produce 4-8 seeds per fruit with C. stipularis producing more seeds (7-11 seeds). In the subgenus Bractearia, the typical fruit produces 7-12 seeds. Two species with many-seeded fruits are C. amazonum (10-17 seeds) and C. pozuzoensis (13-14 seeds). There are several species which average 5-8 seeds per fruit. These are all liana species with the exception of C. nervosa.

#### Seed Germination

Seed germination has been inadequately studied, with only the types for six species known. From the few reported species, Rizzini (1963) noted that epigeal germination occurred in the subgenera Clitoria (C. ternatea) and Bractearia (C. fairchildiana reported as C. racemosa Benth.; C. amazonum) whereas hypogeal germination occurred in the subgenus Neurocarpum (C. laurifolia; C. guianensis; C. falcata reported as C. rubiginosa).

#### Observations

Seeds are unknown for a number of species because the fruits are unknown, or because fruits were collected but seeds were immature or the fruits were unopened. A viscid coat indicates Neurocarpum species, large size indicates Bractearia species, with small, nonviscid seeds in Clitoria species.

A number of seeds exhibited to varying degrees, one or more depressions in the seed face of various sizes. This condition was not consistent in a species, and occurred typically in immature seeds. It

is not reliable as a diagnostic character and may be an artifact of the seed histology.

### Summary

A number of characters were examined in order to more fully describe and compare species. Those characters of diagnostic value have been noted. Most characters can be used to segregate small species groups.

### Species Descriptions

The description of each species will be slightly long, so key terms (e.g., leaves, inflorescences, flowers, fruits) will be underlined and flower type (chasmogamous flowers, cleistogamous flowers) will be highlighted in capital letters. Descriptions will vary somewhat for individual species, but each will follow the general pattern that follows in the generalized description.

Clitoria species. Habit, size, general aspect, general pubescence. Xylopodium or roots. Stem (branch) shape, pith, diameter, pubescence, juvenile structures; bark; buds; scars. Leaves pinnation number, texture; leaflet shape, apex, base, margin, midrib above, primary nerve number, upper surface, lower surface, length, width. Petiole shape, pubescence, ratio to rachis, length; rachis length, internodal segments. Petiolules color, shape, texture, pubescence, length. Stipule duration, striations, shape, apex, pubescence, length, width; stipel duration, striations, shape, apex, pubescence, length, width, terminal versus lateral. Inflorescence type, location, number per locality, number flowers borne, axis pubescence, length, primary branches. Peduncle; rachis, internodal length, length primary branches

bearing pedicels; pedicel pubescence, length. Bract number, shape, apex, pubescence, inner bracts, middle bracts, outer bracts. Bracteole duration, shape, apex, pubescence, length, width, insertion below calyx. CHASMOGAMOUS FLOWERS size, color, odor. Calyx shape, pubescence, nerves, tube length, width at base to width at throat; lobes shape, apex, pubescence, length, width at base, ventral lobe length. Vexillum color, pubescence outside, shape, length, width, claw. Alae color, shape, extension beyond carina, blade pubescence, length, width, claw. Carina color, shape, pubescence, length, width, claw. Staminal tube pubescence, length, free filaments length; anthers length, width, connective. Gynophore length, pubescence; ovary pubescence, length, width; style length, geniculate length; stigma. CLEISTOGAMOUS FLOWERS size, location. Calyx pubescence, type, nerves, tube length, width at base to width at throat; lobes shape, apex, pubescence, length, width base, ventral lobe. Corolla presence, shape, size. Staminal column length, filament number, length; anthers length, width. Gynophore pubescence, length; ovary pubescence, costa presence, length, width; style length; stigma. LEGUME stipitate, color, shape, pubescence, sutures, costa presence, valves texture, curvature, length, width, beak length; dehiscence turns; stipe pubescence, diameter, apex, length. Seeds color, shape, pubescence, viscosity, length, width, thickness; hilum length, width. Seed germination type; cotyledons shape, length, width; primary leaves.

#### Characters Occurring in Relatively Few Species

For most structures there are characteristics limited to a small number of the species within the genus. These characteristics can be

useful in quickly identifying a species. A list of these characteristics follows below.

LEAVES: 3-foliate, digitately compound, C. epetiolata; 1-foliate only, C. simplicifolia, C. cordiformis, and occasional stems of C. kaessneri; upper leaves 3-foliate, lower leaves 1-foliate, C. guianensis, C. densiflora, C. kaessneri, C. australis, C. macrophylla, C. hanceana; 5- and 7-foliate, C. biflora, C. ternatea, C. heterophylla; 7-, 9- or 11-foliate, C. lasciva, C. heterophylla.

LEAFLETS: pubescence on upper surface moderately dense, minute, sandpapery rough texture when finger is rubbed from apex to leaflet base (i.e., retrosely scabrous), C. dendrina, C. brachycalyx, C. froesii, C. hermannii; pubescence on upper surface moderate to scattered, subappressed macrotrichomes, C. biflora, C. ternatea, C. lasciva; pubescence on upper surface rufus, short to long trichomed, C. plumosa, C. obidensis; leaflet width less 1 cm, C. heterophylla, C. fragrans, some C. ternatea; leaflet length less 2 cm, C. heterophylla; midrib strongly raised on upper surface, C. obidensis, C. sagotii, C. leptostachya; primary nerves greater than 16, C. nervosa and occasional leaflets of C. fairchildiana and C. jiminensis; leaflets ceriferous below, C. coriacea; leaflet margin revolute, C. coriacea, C. tunuhiensis. Leaflets large, 10-25 cm long by 4-9 cm wide, subgenus Bractearia.

PETIOLE: petiole elongated, 10-25 cm, C. dendrina, C. brachycalyx, C. brachystegia, C. froesii, and some C. javitensis (NOTE: species with petioles commonly less than 10 cm occasionally have some leaves long-petiolate; the species noted have all mature leaves long-petiolate); petiole subsessile, 0.2-2 cm long, shorter than the rachis, C. biflora,

C. heterophylla, and eight species of subgenus Neurocarpum; petiole absent, C. epetiolata.

STIPULE: stipules highly elongate, 20-30 mm, C. plumosa; stipules elongated, 10-20 mm, C. kaieteurensis; stipules broad, 4-6 mm, C. arborescens, C. kaieteurensis, 6-8 mm, C. densiflora, 7-13 mm wide and foliaceous, C. stipularis.

STIPEL: stipels elongated, 10-20 mm, C. plumosa, and occasionally to 15 mm long in C. obidensis, C. macrophylla, C. stipularis; stipels broad, 2-3 mm wide, C. stipularis and some C. kaessneri.

INFLORESCENCE: highly elongated, over 20 cm, C. pendens, C. leptostachya, C. fairchildiana, occasionally some C. arborea, C. juninensis; inflorescence paniculate, primary lateral branches over 5 mm long, C. arborea, C. amazonum, C. polystachya, C. monticola, occasionally C. juninensis; inflorescence conspicuously zigzag, section Flexuosa, C. woytkowskia, C. flexuosa, C. pozuzoensis; inflorescence cauliferous, section Cauliflorae; inflorescence a peduncle with 1-2 flowers at apex, most of subgenera Neurocarpum and Clitoria.

BRACTS: bracts elongated, 10-16 mm long, C. plumosa, C. flexuosa, C. stipularis, occasionally 7-11 mm long, C. densiflora, C. woytkowskia, C. obidensis; bracts broaden, 4-6 mm wide, C. amazonum, C. woytkowskia, and 6-9 mm wide, C. flexuosa.

BRACTEOLES: bracteoles highly elongated, 25-41 mm long, C. flexuosa, C. woytkowskia, C. obidensis; bracteoles minute, 1-3 mm long, C. dendrina, C. brachycalyx, C. brachystegia, C. hermannii, C. canescens, C. heterophylla, C. leptostachya; bracteoles broad (6 mm or more wide) and long (10 mm or more long), subequal the calyx and

hiding it, sections Bractearia and Flexuosa; bracteoles broad (3-6 mm wide) and not hiding calyx, C. plumosa, C. obidensis; bracteoles inserted 2-5 mm below the calyx, C. coriacea, C. sagotii, C. leptostachya, C. tunuhiensis, and some C. javitensis.

CALYX: calyx tube elongated, 2-4 cm, C. plumosa, C. obidensis, C. flexuosa, C. woytkowskia, C. pozuzoensis, occasionally C. amazonum (NOTE: some species have tubes of 1.5-2.3 cm); calyx tube cup-shaped, C. brachycalyx, C. brachystegia; calyx pubescence dense, silky, C. flexuosa, C. woytkowskia, C. pozuzoensis, C. australis; calyx tube width at base broad, 8-10 mm wide, C. plumosa; calyx nearly glabrous, C. amazonum, C. moyobambensis, C. glaberrima; calyx lobes elongated, 14-18 mm, C. plumosa, C. densiflora, highly elongated, 20-27 mm, C. obidensis; calyx lobes minute, 1-2 mm, C. brachystegia; calyx lobes short, 2-4 mm, C. dendrina, C. brachycalyx, C. glaberrima, C. froesii, C. canescens, C. hermannii, C. nervosa, C. polystachya, C. monticola, C. heterophylla; calyx lobes broad, 5-8 mm, C. obidensis, C. densiflora; ventral lobe elongated, 15-20 mm, C. densiflora, C. stipularis, greatly elongated, 25-35 mm, C. obidensis, C. plumosa; ventral lobe pubescence stiff trichomes, laterally, feather-like, C. plumosa

ANDROECIUM: stamens all free or some filaments free with others connate in 1-3 bundles, C. ternatea; staminal tube greatly elongated, 4-5.5 cm, C. plumosa, C. pendens, C. javitensis, C. obidensis, C. pozuzoensis; staminal tube short, 8-11 mm, C. biflora, C. heterophylla; staminal tube uncinately pubescent near apex, C. nervosa, C. hermannii, C. arborescens, occasionally in C. dendrina, C. brachycalyx; staminal tube pubescence uncinately near base, C. kaessneri; anthers large, 2-3 mm long, C. amazonum, C. flexuosa,

C. pozuzoensis, C. obidensis, C. pendens, C. plumosa, C. froesii,  
C. canescens, C. hermannii; anther connective apiculate, C. andrei,  
C. sagotii, C. brachycalyx, C. plumosa, C. hermannii, C. froesii.

GYNŌECIUM: ovary elongated, 28-32 mm, C. amazonum; style highly  
 elongated, 27-35 mm, C. plumosa, C. pendens, C. obidensis, C.  
pozuzoensis, C. flexuosa, C. cavalcantei, occasionally C. guianensis,  
C. densiflora; style very short, 7-10 mm, C. heterophylla, C.  
cordobensis, 10-11 mm in C. monticola.

VEXILLUM: vexillum long-clawed, claw 15-20 mm, C. amazonum,  
C. javitensis, C. cavalcantei, C. densiflora; flowers occasionally very  
 large, 8-9.5 cm long, C. pozuzoensis, C. obidensis, C. plumosa.

ALAE: ala blade elongate, 3-3.5 cm long, C. plumosa; ala claw  
 elongate, 26-33 mm, C. pozuzoensis; alae scarcely exceeding carina,  
 2-3 mm longer, C. heterophylla.

CARINA: carina broad, 6-8 mm, C. flexuosa, C. pozuzoensis,  
C. woytkowskia, C. obidensis, C. pendens, C. plumosa, C. guianensis.

LEGUME: legume costate, C. stipularis, C. simplicifolia,  
C. densiflora, C. falcata, C. laurifolia, C. guianensis; legume  
 pubescence dense, macrotrichomes, C. javitensis, C. dendrina,  
C. brachystegia, C. brachycalyx; legume broad, 2-4 cm, C. arborea,  
C. fairchildiana, C. juninensis, C. nervosa, C. brachycalyx,  
C. javitensis, C. pozuzoensis; legume width very narrow, 4-5 mm wide,  
C. heterophylla; dehiscence 2-4 turns, C. leptostachya, C. brachystegia;  
 legume convex, subgenus Neurocarpum; stipe subsessile, 1-4 mm,  
C. lasciva, C. biflora, C. ternatea, C. heterophylla, C. kaessneri;  
 stipe highly elongated, 2.5-5 cm long, C. amazonum, C. flexuosa,

C. pozuzoensis, C. javitensis, C. sagotii, C. leptostachya, C. pendens,  
C. dendrina, C. brachycalyx, occasional C. brachystegia.

SEEDS: seeds viscid, subgenus Neurocarpum; seed germination hypogean, subgenus Neurocarpum; large number of seeds per legume, 12-17 seeds, C. amazonum; few seeds per legume, 1-4 seeds, C. kaessneri, C. biflora, C. polystachya, Asian C. mariana.

CLEISTOGAMY: eleven species of subgenus Neurocarpum, characteristics summarized in Tables 7 and 8; chasmocleistogamous inflorescences, bearing one chasmogamous flower and one cleistogamous flower (extremely rare), once in C. guianensis, twice in C. mariana.



## DISTRIBUTION OF CLITORIA

Clitoria is a tropical genus with forty-six species native to the neotropics and subtropics, eleven species native to the paleotropics, and one species native to the neotemperate and tropical Southeast Asian regions. Figure 8 illustrates the generalized distribution of the genus which is found within the zone marked by black lines. Figures 9-13 illustrate the distribution of each subgenus and its sections.

Subgenus Bractearia has twenty-nine species distributed primarily in northern South America and Panama, with two species having isolated populations occurring as far north as southern Mexico, one species from Bolivia, and another species from eastern Brazil. The most primitive section, Bractearia, composed of arboreal and tall fruticose species, is distributed primarily along the Amazon Basin and has one species known from Bolivia (Figure 9). Section Flexuosa, a primitive section of predominately lianas, is distributed in Ecuadorian and Peruvian tropical forests (Figure 9). Section Brachycalyx, a slightly more advanced section composed of mostly arboreal and fruticose species, is distributed in northern South America and Panama (Figure 10). Closely related section Cauliflorae, consisting of liana and a few fruticose species, is also commonly distributed in northern South America, with a few species found in Peru, a few species known from the refugia forests along the Amazon River, and one species located in eastern Brazil (Figure 10).

Figure 8. Generalized distribution of the genus Clitoria.

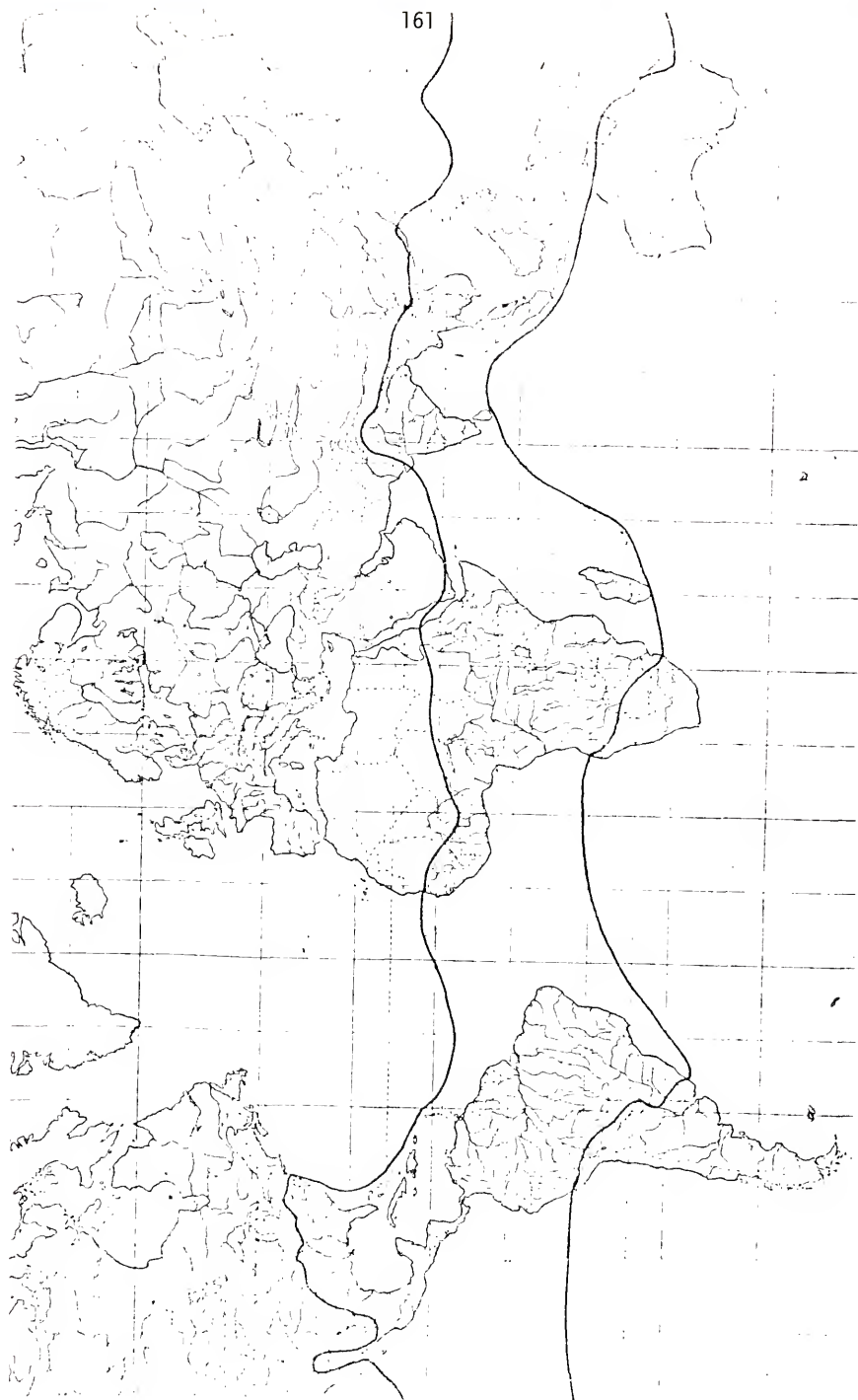
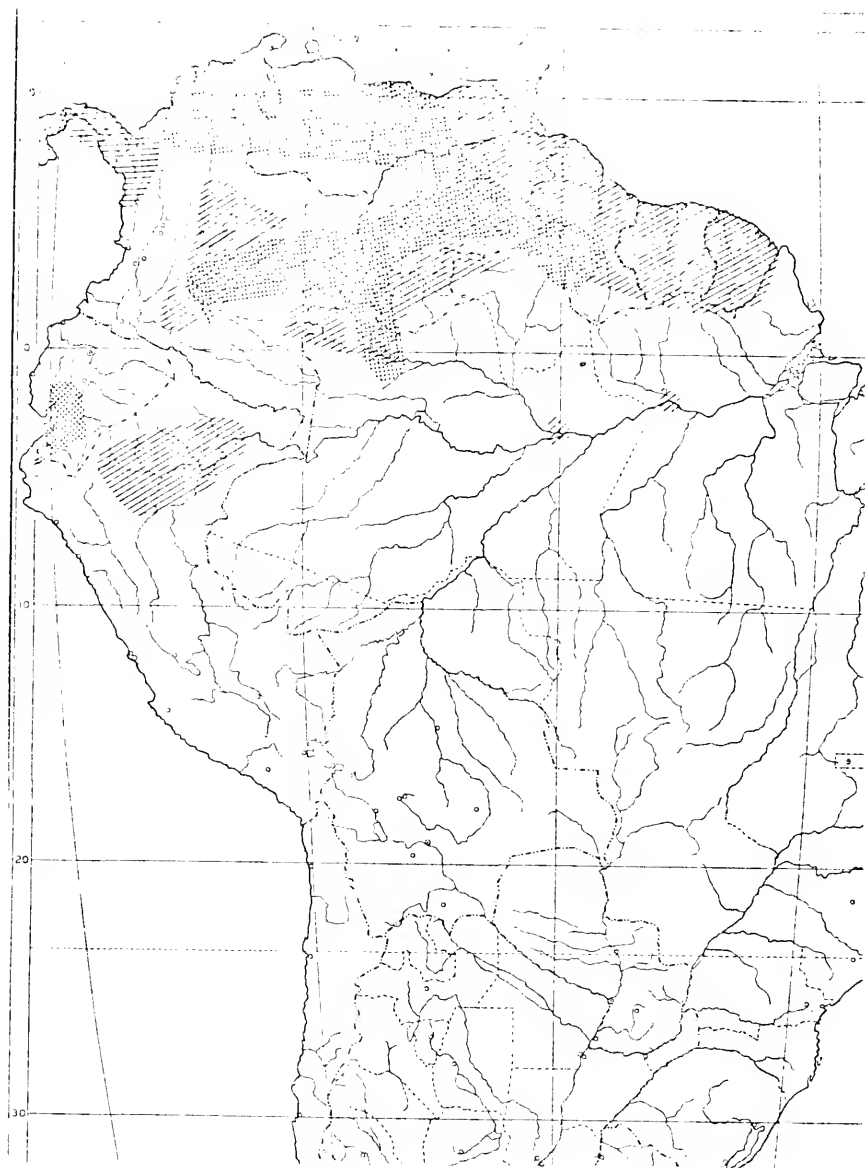


Figure 9. Distribution of two sections of subgenus Bractearia.  
Section Bractearia, diagonal lines; section Flexuosa, dots.



Figure 10. Distribution of two sections of subgenus Bractearia.  
Section Brachycalyx, dots; section Cauliflorae, diagonal  
lines.



Subgenus Clitoria has five species native to the paleotropics of Africa and Southeast Asia, with one anthrogenic species nearly pantropical in its distribution. Figure 11 illustrates the distribution of the subgenus with dotted areas representing the probable native distribution of the subgenus. Clitoria ternatea is commonly cultivated throughout the tropics, and often escapes, flourishes, and becomes naturalized. It is commonly found within the areas bordered by black lines where the species had been introduced by man.

The more advanced subgenus Neurocarpum has twenty-four species and exhibits a disjunct distribution, with most species native to the neotropics or subtropics. Section Mexicana has a widely disjunct distribution with most species found from central Mexico to northern Panama. One species is endemic to northern Argentina and one temperate species is known from the eastern United States and also is native to Southeast Asia (Figure 12). Section Tanystyloba is distributed in Southeast Asia from western India to China (Figure 12). Section Neurocarpum is widespread in the neotropics, distributed from southern Brazil to southern Mexico, and also common in the West Indies (Figure 13). Two species have been introduced into Africa and become naturalized in small populations within the dotted region. One species has been introduced into portions of Southeast Asia and Indonesia where it has become established.



Figure 11. Distribution of subgenus Clitoria. Dotted areas represent probable native distribution; areas bounded by black lines represent regions where the anthrogenic species, C. ternatea, has escaped cultivation and become naturalized.

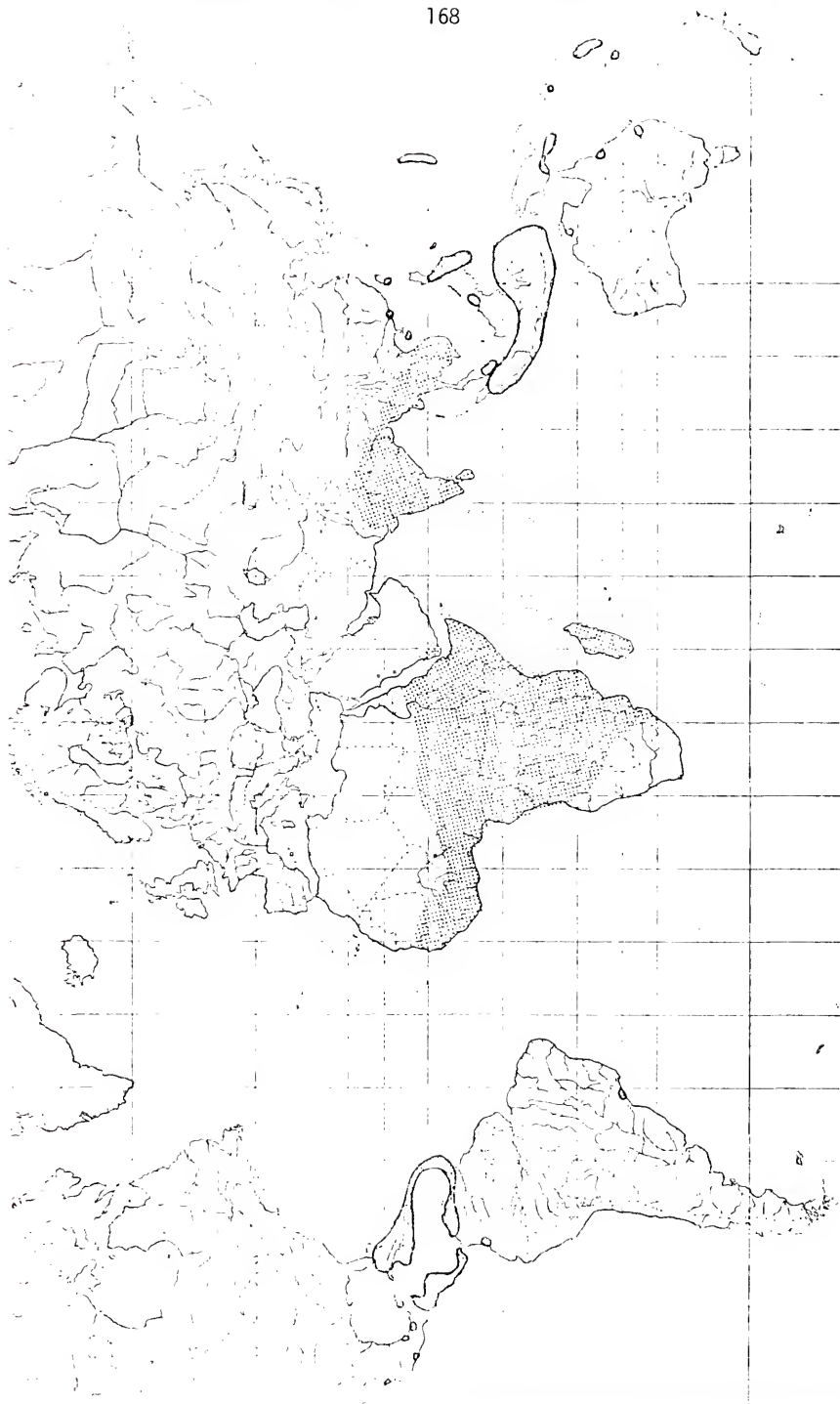


Figure 12. Distribution of two sections of subgenus Neurocarpum.  
Section Mexicana, dots; section Tanystyloba, horizontal  
lines.

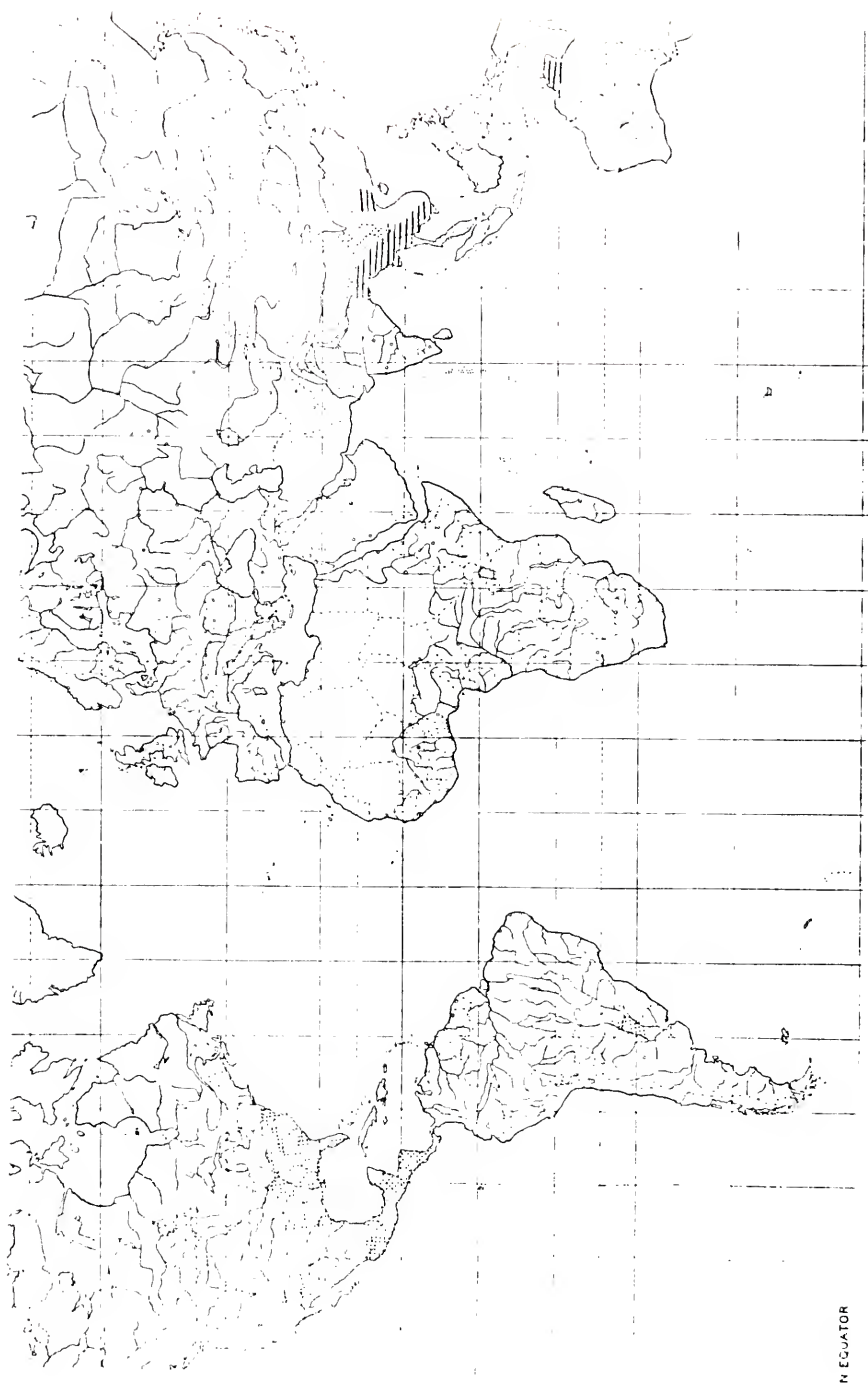
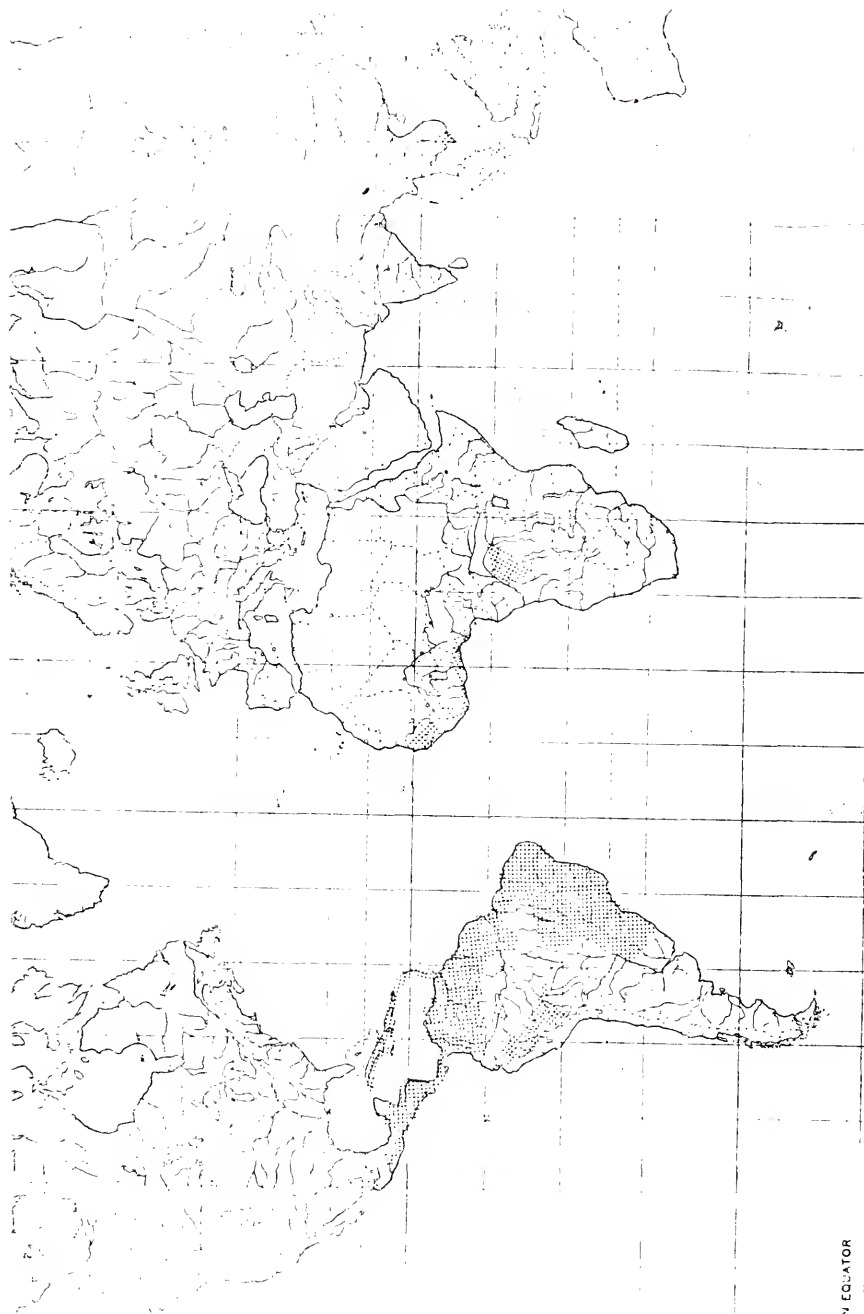


Figure 13. Distribution of section Neurocarpum, subgenus Neurocarpum.



## SYSTEMATIC CRITERIA AND TAXONOMIC NOTES

The monographical study of the genus Clitoria was based upon the classical criteria of morphology, distribution, and comparison of specimens to the types. Additional evidence available from the literature, and limited field experience with the Floridian species, were used for supportive data. From this study a more comprehensive understanding of the genus was obtained which will provide a basic conceptual foundation that can later be supplemented by further research employing biosystematic techniques.

During 1973-1974, requests for loans of Clitoria specimens were mailed to nearly 70 herbaria (those believed to have type collections or known to have specialized in certain geographical areas). Nearly 7000 sheets of specimens were received and examined and have been matched to the types. Herbarium abbreviations wherever used herein follow Holmgren and Keuken (1974). Specimens examined are listed below by the loaning institution's abbreviations.

- A: Arnold Arboretum, Harvard University, Cambridge, Massachusetts, U.S.A.
- BA: Museo Argentino de Ciencias Naturales "Bernardino Rivadavia" e Instituto Nacional de Investigaciones de las Ciencias Naturales Avda, Buenos Aires, Argentina.
- BM: British Museum of Natural History, London, Great Britain.
- BR: Jardin Botanique National de Belgique, Bruxelles, Belgium.
- CGE: Botany School, University of Cambridge, Cambridge, Great Britain.

- E: Royal Botanic Garden, Edinburgh, Scotland, Great Britain.
- F: John G. Searle Herbarium, Field Museum of Natural History,  
Chicago, Illinois, U.S.A.
- FLAS: Herbarium, Agricultural Experiment Station, Gainesville,  
Florida, U.S.A.
- G: Conservatoire et Jardin Botaniques, Genève, Switzerland.
- GH: Gray Herbarium of Harvard University, Cambridge,  
Massachusetts, U.S.A.
- HAL: Martin-Luther-Universität, Sektion Biowissenschaften,  
Wissenschaftsbereich Geobotanik und Botanischer  
Garten, Halle, German Democratic Republic, DDR.
- K: Herbarium and Library, Royal Botanical Gardens, Kew,  
Richmond, Surrey, Great Britain.
- LA: Botanical Gardens-Herbarium, Department of Botany,  
University of California, Los Angeles, California,  
U.S.A.
- M: Botanische Staatssammlung, Menzingerstrasse, München,  
Federal Republic of Germany, BRD.
- MICH: Herbarium of the University of Michigan, Ann Arbor,  
Michigan, U.S.A.
- MO: Herbarium of the Missouri Botanical Garden, Saint Louis,  
Missouri, U.S.A.
- MPU: Institut de Botanique, Université de Montpellier,  
Montpellier (Hérault), France
- NY: Herbarium, The New York Botanical Garden, Bronx Park,  
Bronx, New York, U.S.A.
- P: Muséum National d'Histoire Naturelle, Laboratoire de  
Phanérogamie, Paris, France.
- PENN: Herbarium of the University of Pennsylvania, Philadelphia,  
Pennsylvania, U.S.A. (Acquired by PH in late 1974.)
- PH: Dept. of Botany, Academy of Natural Sciences, Philadelphia,  
Pennsylvania, U.S.A.
- PR: Botanické Oddelení Prirodoved muzea Národného muzea v  
Praze, Praha, Czechoslovakia.
- RB: Jardim Botânico do Rio de Janeiro, Rio de Janeiro, Brazil.



- S: Section for Botany, Swedish Museum of Natural History  
(Naturhistoriska riksmuseet), Stockholm, Sweden.
- SI: Instituto de Botánica Darwinion, San Isidro, Prov. Buenos  
Aires, Argentina.
- U: Institute for Systematic Botany, Tweede Transitorium,  
Heidelberglaan, Utrecht, Netherlands.
- UC: Herbarium of the University of California, Department of  
Botany, University of California, Berkeley,  
California, U.S.A.
- UMO: Herbarium, University of Missouri, Columbia, Missouri,  
U.S.A.
- US: U.S. National Herbarium, Department of Botany, Smithsonian  
Institution, Washington, D.C., U.S.A.
- VEN: Instituto Botánico, Caracas, Venezuela.
- VSC: Valdosta State College Herbarium, Valdosta State College,  
Valdosta, Georgia, U.S.A.
- W: Naturhistorisches Museum, Burgring, Wien, Austria.
- WIS: Herbarium, University of Wisconsin, Madison, Wisconsin,  
U.S.A.

Measurements have been made from structures that were mature or as nearly so as possible. Ranges of variation are given with measurements encountered infrequently enclosed in parentheses. Leaflet size is often quite variable, but was generally taken as representative when found with flowers and fruits, and the smaller end of the range may be indicative of less mature leaves. In flower size, the complicate vexillum and mounting techniques used, make it difficult to determine the maturity. Ranges represent apparently mature flowers, and the smaller end of the ranges may represent flowers not fully mature.

Rarely did the original authors designate holotypes for the species of Clitoria. In many cases one to a few collections were

cited. These "type" collections were treated as syntypes. Most definitions of syntype include the situation in which an author cited two or more collections (i.e. C. multiflora: Galeotti 2323 and 3290), each collection becoming a syntype. In a number of cases only one collection was cited, but specimens of this collection are found in several herbaria (i.e. C. densiflora var. mucronulata: Hassler 9831, BM,F,G-5 sheets,MPU,NY,S,UC,W). It is often in doubt whether the original author examined only one specimen or more than one, and which specimen(s) was that on which the description was based. With no holotype designated, this second example illustrated a second type of syntype collection, one implied but not described in most syntype definitions.

When holotypes were not designated, a lectotype was selected from a syntype specimen. Lectotypes were not selected for those binominals treated in synonymy. In selecting a lectotype, first priority went to the specimen that was believed to have been examined by the original author who erected the species. Next priority went to the specimen which appeared to best match the description as originally published. Last priority went to the specimen which would be the best representative specimen. Priority was not given to the institution from which the specimen was deposited, thus lectotypes will be scattered in various institutions on various continents, rather than localized at one or two institutions near the author of this study.

For new species and new subspecific taxa, holotypes were selected. In a number of cases few to numerous collections were examined. Technically, all will become paratypes when published with the holotype. Although each paratype contributed to the description

as a whole, the type concept (one or more specimens upon which the name of the taxon is based) would be abused by having a large number of "type collections" (e.g., a new variety, C. polytachya var. congesta, has 9 cited collections and a total of 24 sheets examined). Therefore, a representative collection(s) was selected and labeled as the paratype collection, with the remaining collections treated as non-type collections.

In the citation of types, accession numbers were used after the institutional abbreviations (e.g., UC 83907) to identify more specifically a specific specimen. A number of institutions lacked accession numbers; however, in the process of preparing the specimens for loan, some lending institutions placed the loan number and a loan accessional count on the herbarium sheet. These accessional numbers were cited as substitutes for regular accession numbers. The loan number also present on the herbarium sheet is listed below, but was not cited for each individual use because of its repetitiveness. For example, the type specimen of C. arborea (cited as BR-8) indicates that the type specimen is deposited at Bruxelles and bears the loan number "74/2521" and a loan accessional number of "8" within the stamp as described below. A list of these institutions and their loan numbers are as follows (xx is used in place of any accessional number):

BR: Bruxelles specimens have inked, circular stamp with "Herbier Jardin Botanique De l'Etat, Bruxelles" around the margin, and two horizontal lines in the center. The upper line, in pencil, has "xx"; between the lines, in pencil, is the loan number "74/2521"; and below the bottom line, in ink, is "FLAS." Accession numbers range from 1-11. Specimens are cited as "BR-xx."

- E: Edinburgh specimens have an inked, circular stamp with "Royal Botanical Gardens, Edinburgh" around the margin. In the center of the circle, in pencil, is the loan number "60/74" with "xx" below this number, ranging from 1 to 150. Specimens are cited as "E-xx."
- G: Geneva specimens are mounted to a white cardboard strip and pinned to the inside of a folder, occasionally with one or two additional sheets within the folder. The lower right hand corner on the outer front of the folder bears the loan number "3538/xx" where xx ranges from 1 to 588. Specimens are cited as "G-xx" where "xx" may be a multiple number to include the additional sheets upon which the specimen is mounted.
- K: Kew specimens have an inked, elliptical stamp with "Royal Botanical Gardens, Kew" at the upper and lower margins. In the center of the ellipse, in pencil, is the loan number "H0 847/74" with "xx" placed below this number and ranging from 1 to 453. Specimens are cited as "K-xx."
- M: München specimens have a penciled loan number "596/xx" either above or below the data label, but usually placed in the right hand corner. Some specimens bear a gummed strip taped around the specimen, with an inked accession [?] number. Specimens will first be cited by the inked number on the gum strip attached to the specimen, then secondly by the loan number (i.e. as "M-xx") when the gummed strip is lacking.
- P: Paris specimens have an inked, circular stamp with "Herb. Mus. Paris, Phanerogamie" around the margin. In the center, in ink, is "Pret No." with the number "59" next to it, and the number "xx.75" below it. Both sets of numbers are in pencil with xx ranging from 1 to 61. Specimens are cited as "P-xx."

Nontype collections cited for a specific purpose (i.e., an illustration documentation, or a specimen cited which lacks identifiable data) will follow the same style for institutional citation as types.

A small number of specimens were encountered which were labeled as type collections (i.e., "nov. gen.," "sp. nov.") that bore names which apparently are unpublished (e.g., C. pinetorum McFarlin) or were uncited when the name was published in synonymy (Rhombilobium Rich.). Unpublished names will be treated as nomina in scheda (nom.

in sched., an illegitimate name known only from an herbarium label). The collections cited for these names (in both cases) will be the specimens from which the name was obtained, the probable type collections.

Specimen citations include locality data as they appear on the label to avoid a possible change in the data by this author. All months are cited in 3-lettered abbreviations, not by numerals, except in those few instances in which the data for the month versus the date are unclear, then the exact numerals are used. The number of sheets examined from a particular institution are noted; thus "A,BM,G-5 sh., K-2 sh.,W" indicates that this author examined and annotated during this study, five sheets from Geneva, two sheets from Kew, and one sheet from each of the other institutions for this collection.

Specimen citations are arranged geographically. The more modern geographical name for a country is included along with the older name. Major provinces were obtained from field data and from maps contained within the Comprehensive Times Atlas.

# SYSTEMATIC TREATMENT

Clitoria L., Sp. Pl. ed. 1, 2: 753. 1753.

Ternatea Tourn., Mem. Math. Phys. Acad. Roy. Sci., p. 103, Tab. 5.

1706; nom. inval. (Based on Flos clitoridis Ternatensibus Breyne).

Clitorius Petiv. ex Dill., Hort. Elth., p. 90. 1732; nom. inval.

(Based on Clitorius Petiv., Flos clitoridis Ternatensibus Breyne, and Ternatea Tourn.).

Clitoria L., Gen. Pl. 1: 216, no. 572. 1737; nom. inval. (Based on Ternatea Tourn. and Clitorius Dill.).

Ternatea Tourn. ex Mill., Gard. Dict. ed. 4, 3: TERNATEA. 1754.

(Based on Ternatea Tourn.).

Neurocarpum Desv., Journ. Bot. 1: 119. 1813. (Based on

Crotalaria guyanensis Aubl. and M. ellipticum Desv.).

Vexillaria Eaton, Man. Bot. p. 82. 1817; non Vexillaria Raf.

(1818) nec Vexillaria Hoffm. (1824); nom. superfl. (Based on Clitoria L.).

Vexillaria Raf., Amer. Monthly Mag. & Crit. Rev. 2: 268, no. 111.

1818; non Vexillaria Eaton (1817) nec Vexillaria Hoffm.

(1824); nom. illeg. (Type: Clitoria marina L.).

Martia Leandr.-Sacr., Denkschr. Akad. Muench. 7: 238. 1821;

non Martia Sprengl. 1818; nom. illeg. (Type: M. physodes Leandr.-Sacr.).

Martiusia Schultes, Mant. 1: 69. 1822. (Type: Martia physodes Leandr.-Sacra.).

Rhombolobium Rich. ex H.B.K., Nov. Gen. Sp. 6: 406. 1824; nom. inval. in synonym. (Based on Rhombolobium, gen. nov., Richard Herb.).

Neurocarpon Desv. ex Hamilton, Fl. W. Ind. p. 50, no. 101. 1825; nom. illeg. (orthogr. pro. Neurocarpum Desv. 1813).

Rhombifolium Rich. ex DC., Prod. 2: 235. 1825; nom. inval. in synonym. (Based on Rhombifolium canescens, Richard Herb.).

Nauchea Desc., Mem. Soc. Linn. Par. 4: 7. 1826; nom. superfl. (Based on Clitoria L.).

Clytoria Presl, Rostl. 3: 196. 1835; ?nom. illeg. (?orthogr. pro Clitoria L. 1753).<sup>1</sup>

Neurocarpus Desv. ex Haaskarl, Cat. Hort. Bog. Alt. p. 276. 1844; nom. illeg. (orthogr. pro. Neurocarpum Desv. 1813).

Macrotrullion Klotsch ex Rich. Schomb., Br. Guiana Fauna & Flora p. 1202. 1848; nom. inval. sin descr. gen. (?Based on Macrotrullion Klotsch, nov. gen. Mss., Klotzsch herb.).

Trees, shrubs, lianas, subshrubs (woody herbs), herbs or herbaceous vines, erect or sometimes prostrate, apex sometimes climbing by twining, usually pubescent; microscopic trichomes uncinat, macroscopic trichomes variable; pith typically hollow, occasionally solid, bark medium to dark, splitting in longitudinal strips, lighter beneath.

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1. This author is unable to establish title of Presl publication nor obtain a copy. It is presumed that Clytoria Presl was an orthographic variant of Clitoria L. Reference source for Clytoria Presl is Index Kewensis, fasc. 1: 569.

Leaves alternate, odd-pinnately compound, usually 3-foliate, less commonly 1-, 5-, 7-, 9-, 11-foliate, petiolate, occasionally sessile or rarely digitately compound, terminal leaflet usually largest; leaflets entire, midrib and nerves impressed above, conspicuous, prominently raised, reticulate below, primary nerve pairs ascending, usually arcuate towards margin, joining the vein above, secondary veins conspicuously reticulate below. Stipules and stipels usually persistent, striate, erect, appressed, pubescent abaxially; stipel narrower than stipule, often shorter, terminal stipel larger than lateral. Petiole and rachis longitudinally striated, sometimes caniculate to sulcate, often laterally compressed near lower leaflets, petiole base swollen; petiolules subquadrate, rugose, dark-colored.

Inflorescence axillary, terminal or cauliferous, racemose or occasionally paniculate, bearing chasmogamous or infrequently cleistogamous flowers, rarely chasmocleistogamous, multiflowered to uniflowered; peduncles usually solitary, rarely 2-3 in axils, or several, short, fascicled, cauliferous; pedicels paired at nodes. Bracts striated, pubescent abaxially, distributed in three series below pedicels; inner pair of bracts between the pedicels, caducous, smaller than middle and outer bracts; middle pair of bracts concave, opposite and appressed to pedicels, sometimes becoming reflexed in age, persistent, the largest and most conspicuous bracts; outer pair of bracts between the pedicels, deciduous to semipersistent, similar to and slightly smaller than the middle pair of bracts. Bracteoles paired, persistent, striate, usually appressed to calyx, pubescent abaxially. CHASMOGAMOUS FLOWERS resupinate, showy, bisexual, 5-merous, papilionaceous or rarely actinomorphic, blue to violet, pink, or



white, sometimes white fading to pale yellow. Calyx infundibular, persistent in fruit, conspicuously multi-nerved to 10-nerved, apex 5-lobed, upper two lobes (opposite vexillum) subconnate, lowermost narrower, often longer. Vexillum complicate, large and flag-like when expanded, erect, apex emarginate, short-clawed, spurless, pigmentation conspicuous on inner face, darker towards periphery, center light-colored, veins darker-colored, prominent, converging into throat, pubescent outside. Alae falcate-oblong, spatulate, shorter than vexillum, extending beyond carina, adherent in middle to carina, long-clawed. Carina falcate to subfalcate, incurved, acute, shorter than alae, long-clawed. Stamens 10, diadelphous, vexillary stamen free or connate at base to near middle, staminal tube complete or sometimes split at base, apex incurved, often persistent in fruit, glabrous, free filaments short, filiform; anthers uniform, basifixed. Disc observed as conspicuously dark-colored, swollen calyx base. Gynoecium enclosed in staminal tube; ovary stipitate, linear, compressed laterally, many-ovuled, densely pubescent; gynophore usually projecting beyond disc, densely pubescent at apex; style elongate, flattened, dilated apically, bearded lengthwise, geniculate near tip; stigma terminal, flattened to capitate, usually pubescent around base. Actinomorphic flowers showy, 4-5 merous, deep blue to violet, rarely white. Petals all banner-like, subequal. Stamens free or subpolyadelphous. Calyx and gynoecium similar to those of papilionaceous flowers. CLEISTOGAMOUS FLOWERS uncommon, inconspicuous unless with fruit, borne above ground. Petals usually lacking, when present minute, whitish, subtransparent, minutely clawed, one to five, similar. Calyx infundibular, small, persistent in fruit, 5-lobed, similar to chasmogamous calyx. Stamens

short, free or diadelphous, to 10, within the calyx tube. Ovary similar to that of chasmogamous flowers, smaller; style bent abruptly back toward the base; stigma in contact with anthers. Legume stipitate, linear, compressed, straight to subfalcate, thickened on upper or on both sutures, ecostate or infrequently costate, valves flat or convex, weak to strongly depressed between seeds, often microscopically pubescent, beaked by persistent style base, splitting along sutures and then spirally twisted; legume from cleistogamous flowers similar to those of chasmogamous flowers, shorter. Seeds dark brown becoming black, glabrous, smooth or viscid, flat or thickened, face subglobose, or reniform, rarely ovate to oblong.

TYPE SPECIES: Clitoria ternatea L.

NOMENCLATURAL NOTES: The International Code of Botanical Nomenclature established 1 May 1753 as the official starting date for nomenclatural history. Three genera were described in publications prior to this date, Ternatea Tourn. in 1706, Clitorius Petiv. ex Dill. in 1732, and Clitoria L. in 1737. These generic names are illegitimate as they were published contrary to the rules of Article 13 of the Code.

The generic name Clitoria L. became a legitimate name when published in the first edition of Linnaeus' "Species Plantarum," even though it was not accompanied by a description of the genus. Article 41 states that those generic names first published by Linnaeus in "Species Plantarum, ed. 1" are treated as having been validly published on that date (1753), and Article 13, Note 3 states that these generic names are associated with their first subsequent description given under those names in Linnaeus' "Genera Plantarum, ed. 5 (1754)." Linnaeus' description of Clitoria published in 1754 was identical to his

description of the genus in 1737. He described Clitoria as:

CAL. Perianthium monophyllum, erectum, tubulatum, quinquedentatum, persistens. COR. papilionacea. Vexillum maximum, rectum, emarginatum, margine undulatum, patens. Alae oblongae, rectae, obtusae, vexillo breviores. Carina alis brevior, subrotundo-falcata. SLAM. Filamenta diadelphe (simplex & novemsidum). Antherae simplices. IST. Germen oblongum. Stylus adscendens. Stigma obtusum. PER. Legumen longissimum, lineare, compressum, uniloculare, bivalve, apice subulato. SEM. plura, reniformia.

Nearly all references, with the exception of the Gray Card Index, attribute Ternatea to Humboldt, Bonpland and Kunth in 1823. First these authors cited the genus as "Ternatea Tourn." Second, Stafleu (1967, p. 226) established the publication date as Sept. 1824. Thus, the full citation would read: "Ternatea Tourn. ex L.B.K., Nov. Gen. (6)(29): 415, 1824." However, the generic name Ternatea Tourn. ex Mill. became a legitimate name at an earlier date, 1754, when Miller's fourth edition of the "Gardner's Dictionary" followed Tournefort's treatment of the genus Ternatea, with the genus fully described. No type collection is known, although Tournefort did indicate that the genus was named after the Moluccan island of Ternate, and Tournefort's first species was based on Breyne's Ternate specimen. Thus, it is presumed that Breyne's specimen (illustrated in Breyne, Exot. Pl. Cent. p. 76, tab. 31, 1678; specimen may be with Breyne herbaria deposited at Leiden) may be the type.

Desvaux frequently altered the spelling of specific and generic names in his publications. His genus Neurocarpum (1813) became Neurocarpon (1825) and Neurocarpus (1844). Desvaux described the genus briefly in 1813 and more fully in 1814 (Journ. Bot. 2: 75). No type was designated, although in 1813 he stated: "J'y place la Crotalaria

gajanensis, et un espece nouvelle (Neurocarpum ellipticum Desv.)." In 1814, Desvaux listed two species: (I) Neurocarpum gajanensis (syn. Crotalaria guyanensis Aubl.; Crotalaria longifolia Lam.) and (II) Neurocarpum ellipticum. Desvaux made orthographic errors in his citations, which should have been Crotalaria guianensis Aubl. and Crotalaria longifolia Lam. No specimen has been found in Desvaux' herbarium (P) that bears the name N. ellipticum. There is a specimen, "hab in gujanae, Herb. Desvaux (P -59!) that bears the name Crotalaria with "gujanensis Aubl. guy. 2 p. 76, t 305" and "longifolia Lamrk ency. 2 p. 201" placed after Crotalaria on the label. In a darker ink, Neurocarpum is written above Crotalaria and gajanensis is written above the two specific epithets. This specimen is the only known type collection for the genus. One final note: Desvaux misidentified this specimen as Crotalaria guyanensis Aubl. and Crotalaria longifolia Lam. Desvaux' name, N. gajanensis, is usually included in synonymy with Clitoria guyanensis (Aubl.) Benth., but should correctly be placed in synonymy with Clitoria laurifolia Poir.

Vexillaria Eaton and Nauchea Desc. are substitute names for Clitoria L. to express the authors' dissatisfaction with the generic name Clitoria having an alleged reference to the female anatomy. These two names were nomenclaturally superfluous when published, and as described by Article 63 of the Code, are illegitimate. Vexillaria Raf. was published without a description (contrary to Article 41) and was a homonym of Vexillaria Eat. (as described in Article 45), and thus is illegitimate (Article 64). Neither Vexillaria Eaton nor Vexillaria Raf. should be confused with the later published Vexillaria Hoffm. (1824), a synonym of the genus Centrosema (DC.) Benth.

Leandro do Sacramento described Martia without any reference to a type collection. The description indicated a cleistogamous specimen. A Brazilian specimen labeled "Martia physodes Leandro. C. pater Leandro do Sacramento, prope Rio de Janeiro (M 12429!)" agreed with the description and is the probable type. The generic name is a homonym of Martia Sprengl. (1818) and in accordance with Articles 45 and 64 of the Code, is an illegitimate name.

Hutchinson (1964, p. 446) cited "Rhombolobium Rich ex Pfeiffer (1874)" as a synonym of Clitoria L. No reference was given, although based on Stafleu (1967, p. 357), Hutchinson may be referring to: Pfeiffer, Nomenclator Botanicus, vol. 1(2), or 2(1), or 2(2), all published in 1874.<sup>2</sup> Humboldt, Bonpland and Kunth (1824) published "Rhombolobium Rich. mss." as a synonym of Neurocarpum Desv. Thus, Rhombolobium Rich. ex H.B.K., in accordance with Article 34 of the Code, is an invalid name when it is merely cited as a synonym. No type was designed, although a Paris specimen in Richard's Herbarium Guyanensi-Antillanum (P -52!) bears an attached label with the generic description of Rhombolobium as:

- Caul. imipare sublignosus, cylindricus, volubilis, sub...,  
rufescenti-pubesc-
- Fol. trifolia; petiolo sub 2 unciali; ..., ad basim  
...rido, uti caulis piloso; foliis ovalibus,  
emargiumbi, subtus subincauis, supra lucidii,  
subbiuncialibus - Stipulae lanceolatus; stipulellae  
lineares.
- Fl. pedunculi axill. solitarii s. gemicei, recti,  
rigiduli; ad apicem 3-8 flori; florib. ovicalis,  
gemisuit, bracteis 2 lanceolatis singulactive  
stipatit.
- Cal. uncialis; nervosus; subinfundibulis tubulosus,  
aequalis 5 fidas; laciniis lanceolati, erecti.

2. This author has been unable to obtain a copy of Pfeiffer's publication.

Col. alba; Vexillum calyce duplo longius, majusculum, lateribus inflexis (fere in formam connatis) extrorsum rotundatis emarginatis-unguiculatis; ad centrum violaceo-lineatum: Alae illo breviores, oblongae, obtusae, carinae ...plicatae. Carina parva longitudinalis, 2-...; falcata, acuta.

Stam. 10, diadelphe, inclusa; anth. ovatae.

Pist. ovarium stipitatum, lineare: stylus arcuatus, ...ciferus, ad ult... angustum pubescens: stig. glabrum, capitatum.

Legumens: 1-3 uniloc..., oblata medio carinata

subtrigonum: ... simina districatibus.

Sem. 4-6. subglobosa, subgrisea, (reticulo viscido obducta).<sup>3</sup>

This specimen is the probable type for the genus with a Geneva specimen labeled: "Rhombilobium Richard, genre nouveau qui doit être placé à coté du Clitoria. Il y a un angle que ... du milieu du Legume de chaque coté" (G -545!) a probable isotype.

The name Rhombifolium Rich. ex DC. was published by de Candolle as a synonym of Neurocarpum Desv. and in accordance with Article 34 of the Code, it is an invalid name. No type was designated, although de Candolle (1824; p. 236) did publish the name Rhombifolium canescens Rich. ex DC. as a synonym of Neurocarpum guianense Desv. A specimen in the Richard herb. that bears the name R. canescens Rich. is the probable type for the genus. This author has not seen such a specimen.

The name Macrotrullion Klotsch ex Rich. Schomb. was published without a description and in accordance with Article 41 of the Code, it is an invalid name. The type collection was probably a specimen (s) in Klotsch's herbarium that bore the names of either M. splendens Kl. or M. elegans Kl. Stafleu (1967, p. 240) stated that Klotsch's herbarium was deposited at Berlin and subsequently destroyed.

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3. Portions of this handwriting were difficult to read. Illegible letters designated by three dots.

NOTES ON SUBGENERA: The species of Clitoria fall into three natural groups on the basis of morphological and distributional criteria. These groups can be distinguished by their fruits and seeds, and their separate integrities supported by habit, leaf, calyx, androecium, gynoecium, and ala characteristics. The presence or absence of cleistogamy supports the recognition of these three groups. Little work has been undertaken in other areas of research on Clitoria, but the scant cytological and seed germination data argue for the preservation of these groups as defined. Each group forms discrete distributional units and the species are found in similar habitats within the groups, yet somewhat distinct from the other groups. If one compares the morphological description of Clitoria with other legume genera in Hutchinson's treatment (1964), Clitoria is much more polymorphic than these other genera. The distinction in the fruit and seeds supported by a number of other differences suggests that these natural groups represent three genera as opposed to three subgeneric groups. The Clitoria (syn. Ternatea) group and the Neurocarpum group have both been treated in the past as distinct genera. The Neurocarpum group, with more polymorphic differences, has, in fact, been treated as more than one genus. However, in attempting to render Clitoria more natural, this author rejected the treatment of these three groups as distinct genera because of the structural organization of the flower which is consistently similar across all three groups plus the number of similar characteristics of other structures, as indicated in the generic description. The Clitoria flower is unique among the papilionaceous legumes with its resupinate position, bearded style, larger, showy flowers, stalked ovary, and persistent tubular calyx. Resupination of the papilionaceous flower is a unique, advanced

characteristic found in only twenty of the four hundred eighty-three papilionaceous genera. Those genera with resupinate flowers usually have small flowers, campanulate calices, and sessile to subsessile ovaries. None of these genera possess bearded styles. The treatment of the three groups as distinct genera would be, in the opinion of this author, more artificial than natural. Bentham (185b) was the first to recognize that these three groups, when treated as a single genus, rendered a more natural systematic treatment. He combined them with the genus Clitoria in his synopsis of the genus. Bentham recognized these three groups as sections. However, from the greater evidence now available, and the number of differences that occur, it is better to treat these three groups at the level of subgenus, and use the major morphological differences within the groups as the basic characters for designation of sections.

The most polymorphic subgenus is Neurocarpum, which has different types of fruits (turgid throughout vs. turgid only around the seeds; costate vs. ecostate), seeds (subreniform vs. globose vs. ovoid), leaves (3-foliate vs. 3- and 1-foliate or only 1-foliate; stalked vs. subsessile), inflorescences (paniculate vs. racemose; multi-flowered vs. biflowered), flowers (chasmogamous vs. cleistogamous and chasmogamous), and calices (lobes shorter than tube vs. longer than tube), as well as a number of size differences. Some of the characteristics are unique to this subgenus, and absent from other members of the genus. This author attempted to further subdivide this subgenus into additional subgenera using the characters mentioned. However, there were always exceptions to each tentative group formed. Some species were difficult to place, having affinities with more than one group. Therefore, this



concept of splitting this subgenus was rejected as too artificial. Neurocarpum was left intact as a polymorphic subgenus, a more natural treatment, with these characteristics used for sectional segregation.

KEYS TO THE SUBGENERA: Leaves (Table 3), flowers (Table 4), and fruits (Table 7) are contrasted among subgenera in the tables noted in the chapter on Morphology.

1. Fruit flat or occasionally lomentaceous, weakly convex around seeds, depressed between seeds, ecostate, long-stipitate (12-33 mm); seeds smooth, compressed, orbicular, large (7-16 mm dia.); seed germination epigeal; staminal tube (2.5-4 cm); ovary long (10-20 mm); calyx subcoriaceous, multi-nerved, persistent in fruit; inflorescence woody, often nodose, few to multi-flowered; cleistogamy absent; leaves 3-foliate, long-stalked, large (leaflet 8-20 cm x 3-23 cm); petiolule large (4-10 mm); tree, tall erect shrub-treelet, with sometimes a climbing apex, or liana (x = ?) . . . . . I. Subgenus Bractearia (p.193)
1. Fruit flat, ecostate, subsessile (1-4 mm stipe); seeds smooth, compressed, subreniform, small (4-8 mm dia.); seed germination epigeal; staminal tube short (1-2 cm); ovary short (5-9 mm); calyx subpellucid, 10-nerved, shrinking in fruit, inflorescence sublignose, usually 1- or 2-flowered, rarely few-flowered; cleistogamy absent; leaves 5- to 11-foliate, rarely 3- or 1-foliate, subsessile, smaller (leaflets 2-8 x 1-4 cm); petiolule small (1-3 mm); shrub to herb, erect to twining, rarely liana (x = 8) . . . . . II. Subgenus Clitoria (p. 486)

1. Fruit convex around seeds, deeply depressed between seeds, ecostate, or convex, turgid, becoming subtetragonous, with a medial nerve on each valve, short-stipitate (4-14 mm); seeds viscid, thickened, subreniform or occasionally orbicular to ovoid, small (3-6 mm dia.); seed germination hypogean; staminal tube short (1.4-2.3 cm); ovary short (5-9 mm); calyx subcartilaginous, 10-nerved, persistent in fruit, inflorescence sublignose, 2(1)- to several-flowered; cleistogamy present or absent; leaves 3-, 3- and 1-, or 1-foliate, subsessile or long-stalked, leaflet size variable, petiolule usually small (1-5 mm, rarely 6-8 mm); shrub, subshrub (=woody herb) to herb, erect or twining vine ( $x = 12$ ). . . . .
- . . . . . III. Subgenus Neurocarpum (p. 628)

Subgenus Bractearia

- I. Clitoria L. subgenus Bractearia (Mart. ex Benth.) Fantz,  
stat. nov.

Clitoria L. sect. Bractearia Mart. ex Benth., Ann. Wein.  
Mus. Natur. 2: 115. 1837.

Clitoria L. sect. Dendrocyamus Benth., Ann. Ant. Hist.  
3: 44. 1839; nom. superfl.

Clitoria L. sect. Clitorianthes Benth., Journ. Linn. Soc.  
2: 41. 1858; nom. superfl.

Trees, tall erect shrubs-small trees, sometimes with remote branch apices climbing, or lianas. Leaves 3-foliate, large, leaflet apex usually acuminate, sometimes obtuse, acumen (0.5) 1-3 cm long, extreme apex often mucronate, base cuneate to rotund, midrib impressed to raised above; leaflets large, (5) 8-20 cm long, 3-10 (23) cm wide. Petioles elongate, 3-15 (23) cm; rachis much shorter than petiole, 1-4 cm; petiolules large, (3) 4-10 mm. Inflorescence axillary, terminal, or cauliferous, usually several- to multi-flowered, lignose, paniculate, subpaniculate or racemose-nodose, axis extremely short (0.5 cm) to extremely elongated (100 cm); peduncles solitary and axillary, terminal, or fascicled and cauliferous, rachis internodes nearly straight to slightly curved, or occasionally zigzag. Bracts typically (1) 3-7 (16) mm long, 1-4 (9) mm wide. Bracteoles broad, coriaceous, usually subequal to or longer than the calyx, protecting the flower in bud, or narrow and shorter than to sometimes subequalling the calyx. Flowers chasmogamous, usually medium to large (4-9 cm), sometimes small (2-4 cm). Calyx subcoriaceous, subimpressed to

prominently multi-nerved, persistent in fruit, pubescent; tube usually broad at throat (8-11 mm), elongate (1-3 cm), infrequently short (0.6-1 cm), somewhat cup-shaped with minute lobes; lobes usually much shorter than the tube, typically 3-12 mm, occasionally shorter or longer. Vexillum long-clawed (typically 6-15 mm). Alae long-clawed (typically 12-30 mm). Carina broad (typically 4-8 mm), long-clawed (15-40 mm). Stamens diadelphous, vexillary stamen free to near base; staminal tube a closed sheath or sometimes split near base, elongate (typically 2.5-4 cm); anthers 1-3 mm, connective sometimes apiculate. Gynophore 1-8 mm; ovary elongated (1-3 cm); style 1-3.5 cm. Legume long-stipitate, large (typically 6-25 cm x 1-4 cm), flat, occasionally weakly raised around seeds and depressed between seeds, ecostate, lignose, thickened on both sutures, nearly straight, ventral margin sometimes undulating, base cuneate, position obliquely on stipe, stipe lignose, often arcuate, 1-5 cm. Seeds smooth, compressed, orbicular to lenticular, large (7-16 mm dia.), usually 4-12 (17) seeds per pod. Seed germination epigeal. ( $x = ?$ ).

The members of the subgenus Bractearia can be characterized by their woody habit, large 3-foliate leaves with acuminate tips, lignose inflorescences of many flowers, subcoriaceous and multi-nerved calyx, elongate staminal tube and ovary, large lignose legumes borne on elongate stalks, and large, flattened, orbicular seeds.

LECTOTYPIC SPECIES: C. amazonum Mart. ex. Benth.

NOTES: This subgenus has always been treated previously as a section of Clitoria, always intact, although Bentham twice rejected his earlier sectional names and substituted new superfluous names for them (cf. discussion in the chapter on History, pp. 36-40). The name

Bractearia was chosen for the subgenus because it was the oldest name used for this group and the only name validly published. Bentham (1837) originally had placed five species in this group without designating a type species. Later, Bentham (1858) had increased the list to nine species, still lacking a type designation. The name Bractearia Mart. was obtained by Bentham from a specimen (M 12408!) in the Martius Herbarium which bore the name Bractearia amazonica Mart., and annotated as Clitoria amazonica Mart. a Benth. (see p. 252). As only one species, Clitoria amazonum Mart. ex Benth., was involved in the origin of the name Bractearia, it was selected as the leptotypic species for the subgenus.

This subgenus is poorly understood. Over half of the specimens examined were misidentified. Another fifteen percent were unidentified to species. Nearly fifteen percent of the remaining specimens were correctly identified, but bore illegitimate names. Yet the specimens examined have often been observed and cited in floristic treatments. As a result, the descriptions of species in a flora include a composite of several species placed under one name or a description of one species placed under an incorrect name. Thus, this author recommends that one disregard or correct the treatment of Bractearia species (usually included under the superfluous name Clitorianthes) in most floras.

Within the subgenus Bractearia, there are three homogenous groups and one heterogenous assortment. Bentham (1858) recognized two groups, without naming them. These groups will be treated as sections. Section Bractearia is easily recognized by its large bracteoles and paniculate or subpaniculate inflorescences, and includes the type species for the subgenus. It is the most primitive section. Section

Flexuosa is easily recognized by its zigzag inflorescence and the dense appressed trichomes on the calyx, giving it a somewhat silky appearance. All species were described since Bentham's treatment in 1858. Section Brachycalyx is recognized by its small calyx tube with minute lobes and its sublomentaceous fruits. All but one species was described since Bentham's revision in 1858. Section Cauliflorae is a heterogenous group comprised mostly of lianas, with cauliferous and axillary inflorescences, and lacking the distinctive characteristics of the other subgenera. This section includes the larger, unnamed group designated by Bentham in 1858.

Mixed collections were more prominent in this subgenus, particularly when liana specimens were collected. Often the fruiting branches came from a different species, or genus, than the flowering specimen. These mixed collections occurred most frequently in Suriname collections.

DISTRIBUTION: The members of subgenus Bractearia usually occur in the moist tropical forests of South America and Panama.

#### KEY TO SECTIONS OF SUBGENUS BRACTEARIA

1. Bracteoles broad (6-16 mm wide), coriaceous, usually long (10-40 mm) and subequal the calyx (calyx thus hidden from view), rarely shorter than calyx; inflorescence terminal or axillary, paniculate to subpaniculate, primary lateral branches which bear pedicels are subsessile (1-5 mm) to elongate (to 30 mm).
2. Calyx with scattered, short appressed trichomes to glabrate, or rarely pilose; inflorescence straight to weakly curved, internodes non-zigzag; trees or occasionally tall shrubs  
 . . . . . Sect. IA. Bractearia (p.198)

2. Calyx densely pubescent, of short, appressed hairs (more or less silky appearance); inflorescence flexuous, at least near apex, internodes weak to strongly zigzag; lianas, occasionally shrubs or trees . . . . . Sect. IB. Flexuosa (p. 265)
1. Bracteoles narrow (1-4 mm, rarely to 6 mm wide), subcoriaceous, usually short (2-12 mm, rarely very long and then always narrow) and less than calyx length, rarely subequalling the calyx (then calyx conspicuously viewed); inflorescence axillary (often appearing before leaves) and/or cauliferous, racemose, the primary lateral branches absent or represented by a conspicuous knob to 1 mm (nodose).
3. Calyx tube shortened (0.6-1.3 cm) with minute lobes (1-3 mm, rarely to 5 mm); legume sublomentaceous, conspicuously depressed between seeds at maturity; trees or tall shrubs-small trees, rarely lianas . . Sect. IC. Brachycalyx (p. 295)
3. Calyx tube elongate (1-3 cm) with conspicuous teeth (4-18 mm); legume flat, sometimes weakly raised around seeds, but not conspicuously depressed between seeds; lianas or rarely shrub-treelets . . . . . Sect. ID. Cauliflorae (p. 349)

# Section Bractearia

IA. Clitoria L. subgenus Bractearia (Mart. ex Benth.) Fantz

section Bractearia Mart. ex Benth. emend. Fantz

Clitoria L. sect. Bractearia Mart. ex Benth., Ann. Wein.

Mus. 2: 115. 1837.

Clitoria L. sect. Dendrocyamus Benth., Ann. Nat. Hist.

3: 44. 1839; nom. superfl.

Clitoria L. sect. Clitorianthes Benth., Journ. Linn. Soc.

2: 41. 1858; nom. superfl.

Trees or occasionally tall shrubs. Inflorescence paniculate or subpaniculate, lignose, the primary lateral branches bearing the pedicels (I) 4-30 mm; the axis internodes non-zigzag. Calyx pubescence typically scattered, short appressed trichomes to glabrate, infrequently pilose. Bracteoles coriaceous, subequal to calyx (calyx usually hidden from view), 6-16 mm wide and (II) 14-25 (28) mm long. Legume flat, coriaceous to sublignose, typically broad, (1.5) 2-4 cm wide, and often with sutures thickened; pubescence usually glabrous or microscopically uncinat, macroscopic trichomes, when present, conspicuous along sutures.

The members of the section Bractearia are characterized by their tree-like habit, (sub-) paniculate inflorescences, glabrate calyx, broad, thick-sutured fruits, and large conspicuous bracteoles which obscure the calyx.

LECTOTYPIC SPECIES: C. amazonum Mart. ex Benth.

NOTES: This section is the most primitive section of Clitoria, and is probably most typically represented by C. arborea. Most species are closely related forming a central core from which there appear to



be two distinct evolutionary departures. The first divergence is represented by C. nervosa in which the calyx becomes pilose and the flower size and most flower structures become smaller. The second divergence is represented by C. amazonum (the lectotypic species) in which the apex shows climbing tendencies and the flower size (and many component floral parts) become very large.

This section is easily distinguished from the closely related section Flexuosa by the tree-like habit, sparse calyx pubescence, and non-zigzag inflorescences. Only in C. amazonum are the flowers larger, as are the members of section Flexuosa, although the conspicuous lateral branches in the inflorescence would distinguish it from Flexuosa members.

DISTRIBUTION (Figure 9): The members of section Bractearia are located generally in the tributaries of the Amazonum basin, with endemic species at its fringe.

#### KEY TO SPECIES:

1. Calyx pubescence glabrate to pubescent with scattered appressed hairs; calyx tube 13-18 (25) mm; flowers larger, 4-8 cm; bracteoles (13) 15-28 mm; bracts long, 4-8 mm.
2. Flowers medium, 4-6 cm; vexillum pubescence moderately dense appressed; stipules (5) 6-12 mm; legume width broad, 2.2-4 cm; stipe short, 1.3-2.2 cm; bracteole width narrower, 6-12 mm.
3. Inflorescence paniculate, primary branches that bear the pedicels conspicuous, elongate, 5-30 mm; ovary short, 7-9 mm.  
(Amazon Basin; Brazil, Peru). . . . . 1. C. arborea

3. Inflorescence subpaniculate, primary branches that bear the pedicels subsessile to very short, 1-5 (8) mm; ovary longer, 11-14 mm.
4. Leaflet pubescence below glabrate to pubescent with short, appressed hairs confined mainly to nerves; leaflets acuminate, acumen (1) 1.5-3 cm; style short, 12-16 mm.
5. Inflorescence elongate, 8-42 cm; calyx pubescence of scattered appressed hairs; stipule narrow, 2-3 mm wide; bracteoles long, 17-23 mm; bracts short, 4-8 mm; plant of coastal deltas. (Brazil: Amapa to Maranhão). . . 2. C. guirchildiana
5. Inflorescence short, to 5 cm; calyx glabrate; stipule broad, 4-6 mm wide; bracteoles short, 12-15 mm; bracts long, 8-11 mm; plant of lower mountains. (Peru) . . . 5. C. moyobambensis
4. Leaflet pubescence below subvelutinous; leaflets obtuse to short acuminate, acumen absent to 0.5 (1) cm long; style elongate, 16-21 mm.
6. Bracteoles 22-25 mm long, 9-12 mm wide; flowers 4.5-5.5 cm; vexillum pubescence of appressed hairs mainly along nerves; leaflets acuminate, acumen 0.5-1 cm; stipules deciduous; stipels short, 2-5 mm; tree. (Ecuador) . . . . . 3. C. andrei
6. Bracteoles 15-22 mm long, 7-10 mm wide; flowers 4-4.5 cm; vexillum pubescence of a densely appressed, tawny-silky appearance; leaflets obtuse to abruptly

- minutely acuminate, acumen to 0.5 cm; stipules persistent, 8-11 mm; stipels long, 5-10 mm; tall shrub. (Peru) . . . . . 4. C. juinensis
2. Flowers large, 6-8 cm; vexillum pubescence sparsely appressed to glabrate; stipules short, 2-5 mm; legume width narrow, 1.3-1.9 cm; stipe elongate, 2.5-5 cm; bracteole broader, 10-16 mm wide. (Amazon Basin: Brazil) . . . . . 6. C. amazonum
1. Calyx pubescence pilose; calyx tube short 10-12 mm; flowers small, 3-4 cm; bracteoles short, 11-13 mm; bracts short, 3-4 mm. (Bolivia & the state of Acre, Brazil) . . . . . 7. C. nervosa

1. Clitoria arborea Hoffm. ex Benth., Ann. Wein. Mus. Natur.

2: 115. 1837.

Vexillaria arborea Hoffm. ex Benth., l.c., pro syn.

Clitoria hoffmanseggii Benth., Journ. Linn. Soc. 2: 43. 1858;  
nom. superfl.

Ternatea arborea (Benth.) Kuntze, Riv. Gen. Pl. 1: 210. 1891.

Tree, 3-18 (27) m tall, to 46 cm d.b.h.; pubescence typically of short appressed hairs to glabrate. Buttress roots (vide Schultes & Black 8272). Branches hollow, to 11 mm thick, juvenile branches uncinat-pubescent with some appressed hairs, becoming glabrous with age, internodes 1-6 cm; bark brown, prominently longitudinally striated; buds 6-8 mm long; leaf scar elliptical-orbicular, two shallow longitudinal depressions near margin, bundle scars inconspicuous. Leaves 3-foliate, coriaceous, leaflets broad elliptic to obovate, apex generally obtuse and abruptly short acuminate, acumen to 0.7 cm, rarely

to 2 cm, occasionally retuse, base rotund, midrib impressed above, primary nerves of (8-) 10-14 pairs, dark green and glabrous above, occasionally with minute hairs along midrib, green and glabrate below with appressed hairs along nerves, rarely spreading & more conspicuous, 5-17.5 cm long, 3-10 cm wide, terminal leaflet largest. Petiole angular terete, 3-11 cm, with uncinata and short macroscopic trichomes; rachis compressed, 1.5-3.5 (4) cm. Petiolules subquadrangular, dark-shaded, uncinata - pubescent, (4) 6-11 cm. Stipules deciduous, elongate, triangular, acute to acuminate, uncinata and strigose, ciliate toward apex, 5-10 mm long, 2 mm wide; stipels deciduous, linear, acute, uncinata - pubescence, 5-11 mm long. Inflorescence axillary and terminal, solitary to few fascicled, paniculate, lignose, multi-flowered, rufo-strigose and uncinata, central axis 2-30 cm, primary branches which bear the pedicels conspicuous, striate, arcuate, broader near apex, 5-30 mm. Pedicels paired, 4-7 (8) mm. Bracts at base of primary branches ovate, acute, concave around branch, persistent, reflexed in age, 4-6 mm long; bracts at base of pedicels with persistent middle pair, ovate, acute, concave, 5-8 mm long, 2.5-4 mm wide, outer bract deciduous, 2 mm x 0.4 mm, erect, inner bracts not observed. Bracteole large, coriaceous, subequalling the calyx, broad oblong-elliptic, obtuse or often splitting at apex and appearing toothed, uncinata and sparsely strigose, 17-26 mm long, 6-11 mm wide. Flowers purple to violet, medium size, 4-6 cm. Calyx uncinata with scattered, short strigose hairs, tube 13-18 mm long, 4-7 mm wide at base to 8-11 mm wide at throat, lobes deltoid, acute, 4-7 mm long, 3-4 mm wide, ventral lobe 5-8 mm x 2 mm. Vexillum obovate, pubescence tawny appressed, moderate, 2-4 cm wide, claw 6-9 mm. Alae extended

beyond carina 6-8 mm, blade 16-27 mm long, 4-8 mm wide, claw 13-16 mm, conspicuously uncinat-pubescent near blade. Carina falcate, 8-13 mm across, 4-5 mm wide, uncinat pubescent, claw 24-33 mm. Staminal tube glabrous, 26-33 mm, free filaments 3-5 mm; anthers 1.5-1.75 mm long, 0.4-0.6 mm wide. Gynophore 4 mm; ovary, 7-9 mm long, 1 mm wide bearing dense appressed hairs; style 16-21 mm long, geniculate 6-7 mm from distal end, beard of stiff trichomes; stigma capitate. Legume stipitate, slightly exerted beyond calyx, green to brown, glabrate with uncinat and short, erect trichomes along sutures, flat, thick-coriaceous, to 3-4 mm thick, sutures very thickened, slightly wing-like, weakly raised around seeds, nearly straight, obliquely positioned on stipe, 10-24 cm long, 2.3-4 cm wide, narrower at base, 8-15 mm wide; beak 4-7 mm; dehiscence causing valves to twist one-quarter of a turn. Seeds with nearly orbicular faces, compressed, 2 mm thick, black to dark brown, smooth, glabrous, 9-17 mm long, 10-14 mm wide, 7-11 seeds per pod, hilum oblong, 3 mm x 1.5 mm. Figures 14 and 15.

Hoffmannsegg's Clitoria is characterized as a tree of the Amazon Basin with paniculate inflorescences bearing medium sized purple-violet flowers, large coriaceous bracteoles subequal to calyx, and large, broad legumes with thickened wing-like sutures.

PHENOLOGY: The species has been collected in flower from April to July and September to January. Fruits were collected in September, December, and May to July.

TYPE COLLECTION: BRAZIL. Pará, Sieber s.n. (LECTOTYPE: BR-8! Holotype probably at B, destroyed in war).

Bentham originally published the name C. arborea in 1837 based upon Hoffmannsegg's name which Bentham cited as "Vexillaria arborea

Figure 14. Clitoria arborea - I. Var. arborea: (a-b) leaflets, x 1; (c) juvenile inflorescence, x 1; (d) flower, x 1; (e) complicate vexillum, x 1; (f) ala and carina, x 1; (g-h) calyx with staminal tube, x 1; (i) gynoecium, x 1; (j) calyx, x 1. (Duarte 6922, FLAS 122958: a. Krukoff 8104, NY: b-j.)

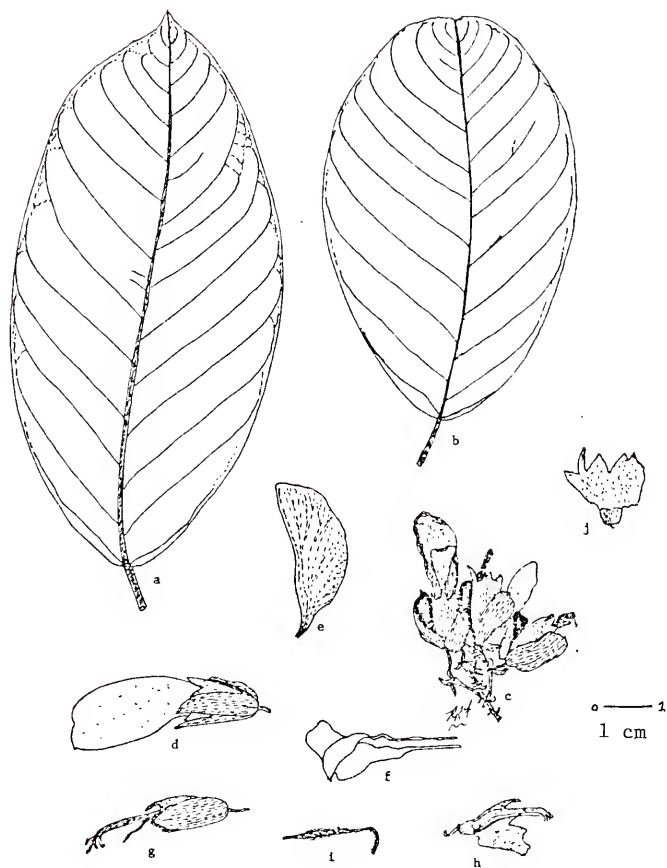
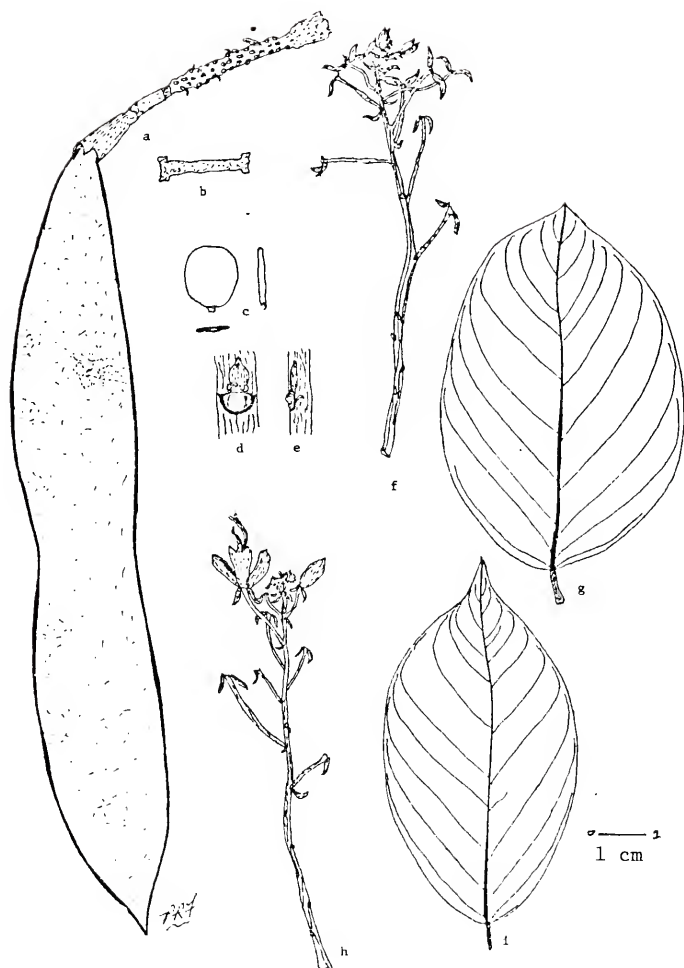


Figure 15. *Clitoria arborea* - II. Var. *arborea*: (a) fruit, x 1; (b) x-section of fruit, x 1; (c) three views of seed, x 1; (d) leaf scar, x 2; (e) stipule scar, x 2. Var. *longiramosa*: (f) smaller inflorescence, x 1; (g) leaflet, x 1. Var. *pseudoamazona*: (h) smaller inflorescence, x 1; (i) leaflet, x 1. (Dahlgren & Sella 107, F 601565: a-b,d-e. Krukoff 5335, S: c. Krukoff 1689, NY: f-g. Krukoff 5719, NY: h-i.)





Hoffm. MSS," in synonymy. The only specimen cited (the type) was "Pará, Sieber." Stafleu (1967, p. 206) indicated that Hoffmannsegg's types were most probably placed at Berlin. The Berlin legume collection was destroyed by fire during World War II, and presumably the type for V. arborea was lost. A Bruxelles specimen believed to be an isotype was selected as the lectotype. The Bruxelles specimen had the same data cited by Bentham. In addition, in an iron based ink faded brown, the name "Vexillaria n." was written on one line with "arborea H." written on the next line. The script in brown ink below reads: "Clitoriae monini huic substituend putavit Hoffmegg-Sed hoc genus a Clitoria diversum videtur" or a Clitoria name was substituted. Hoffmannsegg had thought that this genus (Vexillaria) was different from Clitoria. The word "Clitoria" written in black ink beginning to fade brown was placed in front of the term "arborea H." The Sieber specimen was originally identified as Vexillaria arborea Hoffm. and later annotated to Clitoria. Hoffmannsegg described the genus Vexillaria (presently in synonymy with Centrosema) in 1824 and included one species. There is no record of any additional names published, except for V. arborea and V. triqueta published by Bentham in 1837 in synonymy. The Bruxelles specimen is believed to be an isotype, and thus selected as the lectotype.

In 1858, Bentham published the superfluous name C. hoffmanseggii, citing "C. arborea, non C. arborescens Ait." in synonymy and including Sieber as one of the three collections cited. Although similar in spelling, the terms arborea and arborescens are distinct such that confusion should not result between them. The name C. hoffmanseggii was invalid since it included the type of a prior named species.

The Riedel and Mathew specimens cited by Bentham with the publication of the name C. hoffmanseggii have been cited as types. However, since Bentham had substituted the name for C. arborea and included its type, "Brazil, Pará, Sieber," then the only type is the Sieber specimen, and the Mathew & Riedel specimens are merely additional cited specimens. Neither the Mathew specimen from Moyobamba (K!) nor the specimen from Tarapoto (CGE!E!K!) match the type Sieber specimen. Of several Riedel specimens, Riedel 163 (K!) most closely matches the type and may be the one Bentham referred to in his citation. This specimen was placed in a type folder and bears the words "Hb. Mus. Petrop." cited by Bentham as the location of Riedel specimen. This specimen also bears the name "C. racemosa Benth., Ann. Mus. Vind. 2: 114" and has been distributed via photographs as the type of C. racemosa, which it is not, and in addition has not been cited for the species. This name represents an early misidentification.

VERNACULAR NAMES: BRAZIL (ACRE): Ingapia, Krukoff 5335.  
COLUMBIA: nai-chee-ke (Tikuna name), Schultes & Black 8450. PERU:  
Burro yacuana, Woytkowski 6253.

ECONOMIC IMPORTANCE: In Peru, the leaves were reported as bluish-brown below and used as a dye for coloring textiles (Woytkowski 6253). The seeds were noted as alkaloid positive (Schultes et al. 24120), although the specimens examined lacked fruits and seeds.

NOTES: Clitoria arborea is often cited in early literature as closely related to C. amazonum or a possible variety of that species. However, when compared, there are too many characters which segregate them to consider reducing these two species to varieties of one species. Clitoria amazonum is easily distinguished by its larger flowers

(6-8 cm), short stipules (2-5 mm), and narrow legume (width less 2 cm) on elongated stipes (2.5-5 cm). These two species have often been misidentified for each other in the past.

Clitoria fairchildiana (syn. C. racemosa Benth.) is also frequently cited as having possible affinities. Although it is more closely related to C. arborea than C. amazonum, C. fairchildiana is a distinct species, easily segregated by its more elongate, subpaniculate inflorescence with short primary branches (1-5 mm), narrower oblong-elliptic leaves, drooping branches which reach the ground, and coastal habitats.

There are three varieties which can be distinguished by their inflorescences, leaves, and pubescence of the calyx and vexillum. Some labels bear annotations "new sp?" but are unnamed. These collections are best placed at the level of variety because of the large number of characteristics that agree with C. arborea.

DISTRIBUTION (Figure 16): The species is found in scattered locations in forests along the Amazon River and its major tributaries in Brazil and Peru, and the southeastern apex of Amazonas, Colombia. The only elevations cited were the Schultes collections in Colombia as 100 m and Woytkowski collections of Peru as 600-800 m for the typical variety. Elevations of 1200-1600 m were cited for the nontypical varieties.

#### KEY TO VARIETIES:

1. Leaflets obtuse to abruptly short acuminate, acumen 0.3-5 mm, glabrous above, lower surface inconspicuously pubescent of short, appressed hairs on major nerves (vidi 20-30x); calyx pubescence of

scattered appressed hairs; vexillum pubescence of moderately dense, appressed trichomes.

2. Primary branches of inflorescence that bear pedicels short, 5-9 mm; inflorescence short, 2-7 cm (9 cm in fruit) . . . .  
 . . . . . 1a. var. arborea
2. Primary branches of inflorescence that bear pedicels elongate, (7) 10-30 cm . . . . . 1b. var. longiramosa
1. Leaflets long acuminate, acumen 7-15 mm, with short pubescence on midrib above, lower surface with conspicuous, spreading hairs along major nerves (vidi 10 x); calyx nearly glabrate, appressed hairs more densely packed on ventral edge; vexillum pubescence with appressed hairs concentrated along folded edge, subglabrate elsewhere or following nerves . . . . . 1c. var. pseudoamazona

1a. Clitoria arborea var. arborea

Vexillaria arborea Hoffm. ex Benth., l.c., pro syn.

Clitoria hoffmanseggii Benth., Journ. Linn. Soc. 2: 43.

1858; nom. superfl.

Ternatea arborea (Benth.) Kuntze, Riv. Gen. Pl. 1: 210.

1891.

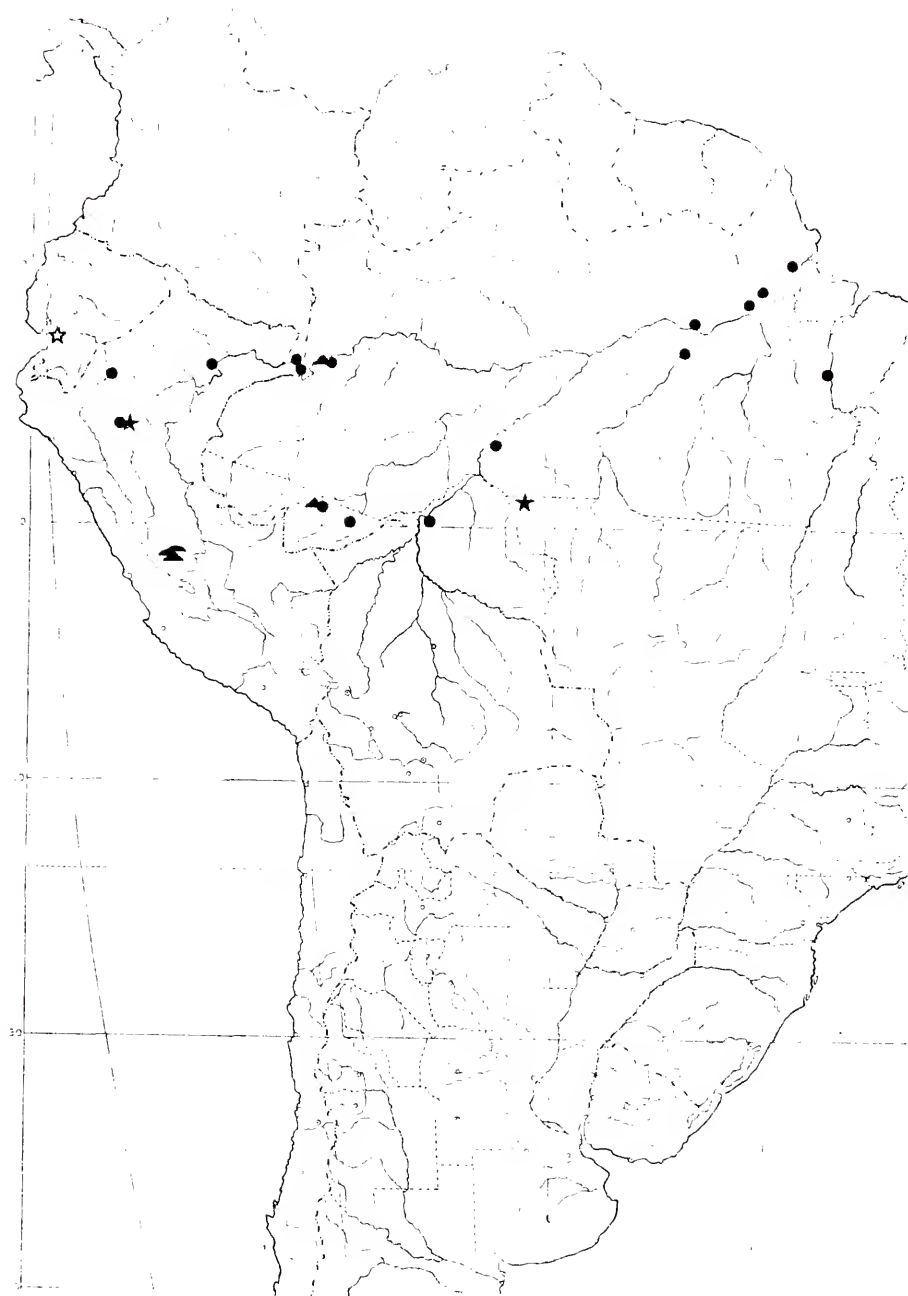
Tree. Leaflets generally obtuse or abruptly short acuminate, acumen to 5 mm, seemingly glabrous but bearing minute, perpendicularly appressed trichomes to major nerves below. Inflorescence short, 2-7 (9) cm, primary branches that bear pedicels 5-10 mm. Calyx pubescence of short, scattered appressed hairs. Vexillum pubescence moderately dense over surface.

## DISTRIBUTION (Figure 16):

B R A Z I L. AMAPA: Macapá, estrada para Fazendinha, 19 Jul 1951, Froés & Black 27487(NY); Cachoeira de S. Antonio do Jarí em Ilha, 20 Nov 1967, Oliveira 3714 (NY); Coastal region, 0°17'N-51°5'W, 7 Jul 1962, Pires & Cavalcante 51990 (NY,U). PARÁ: Cacaual Grande perto da Ilha do Amana, 1 Nov 1950, Black & Ledoux 50-10500 (NY); Boa Vista on Tapajós River, May-Jun 1929, Dahlgren & Sella 107 (F); Almeirim, 11 Apr 1903, Ducke 3461 (BM, RB-mixed with C. simplicifolia); Alenquer, 31 Jul 1903, Ducke 3765 (RB); l.c., 27 Dec 1903, Ducke 4925 (BM,RB-2 sh.); chemis de fer d'Alcobaca Station Breu Branco, Rio Tocantins, 1 Jan 1915, Ducke 15576 (RB-2 sh.); Estrada de Ferro Tocantins, 25 Sep 1948, Froés 23523 (A,NY). AMAZONAS: Esperanca, ad ostium fluminis Javari, 26 Oct 1945, Ducke 1825 (A,F,NY); Camation, border of river, 25 Jan 1949, Froés 24006 (NY); ad Rio Madeira, Riedel 163 (K, S-photo of K); Mun. Humayta, near Tres Casas, Basin Rio Madeira, 14 Sep-11 Oct 1934, Krukoff 6125 (A,BM,F,G-2 sh.,MICH,MO,NY,U); Mun. São Paulo de Olivenca near Palmares Basin Rio Solimões, 11 Sep-26 Oct 1936, Krukoff 8104 (A,BM,F,G,MICH,MO,NY,S,U). RONDÔNIA: Basin Rio Madeira, 167-9 km, Madeira-Mamoré RR., near Mutumparaná, 6 Jul 1968, Prance et al. 5610 (NY,US). ACRE: Rio Branco, 17 Jan 1944, Baldwin 3170 (US) and 3171 (US); Foz do Macauhaw, Rio Purus, (trib. Rio Yaco), 9°20'S-69°W, 9 Aug 1933, Krukoff 5335 (A,BM,F,G-2 sh.,LA,M,MICH,MO,NY,S,U,UC,US,WIS).

C O L O M B I A. AMAZONAS: Trapecio amazónico Loretoyacu River, 100 m, Sep-Nov 1944, Schultes 6122 (GH,NY,US); l.c., 20-30 Oct 1945, Schultes 6611 (GH,US); l.c., Sep 1946, Schultes & Black 8272 (F,US); l.c., Oct 1946, Schultes & Black 8450 (GH,US); l.c., Leticia, Sep-Nov

Figure 16. South American distribution of three species of section Bractearia. Clitoria arborea var. arborea (●), var. longiramosa (★), var. pseudoamazonica (▲); C. andrei (☆); C. juninensis (◐).





1944, Schultes 6194B (GH); Río Amazonas, near mouth of Rio Loretoyacu & Puerto Narino, 13-15 Sep 1966, Schultes, Raffoul, & Soejarto 24120 (US).

P E R U. LORETO: Iquitos, 100 m, 29 Sep 1929, Killip & Smith 30000 (A,NY,US); Stromgebiet des Marañon von Iquitos aufwärts bis zur Santiago-Mundung am Pongo de Manseriche, ca 77°30'W, San Isidro, 1924, Tessman 4953 (F-frag., G). SAN MARTÍN: ca 900 m, 26 Nov 1936, Woytkowski 25 (F); Rioja, 800 m, 28 Dec 1960, Woytkowski 6062 (GH,UC, US); I.C., 10 Feb 1961, Woytkowski 6253 (MO).

Ib. Clitoria arborea var. longiramosa Fantz, var. nov.

Tree. Leaflets generally obtuse or abruptly short acuminate, acumens to 5 mm, broad elliptic to obovate, seemingly glabrous below but with minute appressed hairs along major nerves. Inflorescence elongate, (7) 10-25 (30) cm, primary branches of inflorescence elongate, 12-30 mm. Calyx pubescence of short, scattered appressed hairs. Vexillum pubescence moderately dense.

TYPE COLLECTION: BOLIVIA. Guanai, 2000 ft., May 1886, Rusby 2399 (HOLOTYPE: NY-"Columbia College Herbarium." Isotypes: F 164432, GH, MICH-2 sh., NY-2 sh., PH, US 76908).

The Rusby 2399 collection was the only one with both mature fruits and flowers which indicated its affinities with C. arborea. The Columbian specimen now deposited at New York was selected as the holotype because it had a mature fruit, several inflorescences which illustrated the elongated primary branches, calices in place, plus a packet with flowers. None of the other specimens has this combination.

The other New York sheets have less material, as does each Michigan sheet. The Gray Herbarium specimen lacks inflorescences, whereas the Field specimen's primary branches have been aborted. Others either lack fruits or flowers or inflorescences.

DISTRIBUTION (Figure 16): The three collections are widely scattered within the range of the typical variety, but the only cited elevation places the variety at 1200-1600 m.

B R A Z I L. MATO GROSSO: source Jatuarana River, Machado River region, Dec 1931, Krukoff 1689 (Paratypes: A,BM,G-2 sh., MICH, MO,NY,S,U,UC). P E R U. SAN MARTÍN: Zepelacio, near Moyobamba, 1200-1600 m, Jan 1934, Klug 3505 (Paratypes: A,F,GH,MO,NY,S).

1c. Clitoria arborea var. pseudoamazonica Fantz, var. nov.

Tree. Leaflets ovate-elliptic, acuminate, acumen 7-15 mm, conspicuously pilose on nerves below. Inflorescence elongated, 10-30 cm, primary branches which bear pedicels medium length, 8-15 mm. Calyx glabrate, appressed hairs concentrated along ventral margin. Vexillum subglabrate with few appressed hairs along nerves and concentrated near folded margin.

TYPE COLLECTION: BRAZIL. Amazonas, Mun. São Paulo de Olivença near Palmares, Basin Rio Solimões, 11 Sep-26 Oct 1936, Krukoff 8208 (HOLOTYPE: US 2169816. Isotypes: A,F 927714, G 295 & 296, MICH, MO 1175978 & 1250450, S,U 38199A).

Both collections are nearly equivalent in their inflorescences and flowering material, and lack of fruit. The Smithsonian specimen of Krukoff 8208 was selected as the type because it had more flowering material and was a typical representative of the variety.

NOTES: The two collections of this variety were identified as C. amazonum or near C. amazonum which they superficially resemble in leaflet shape and pubescence, inflorescence, and flowers. However, a closer examination would indicate that these specimens are distinguished from C. amazonum by: its smaller flowers, bracteoles, calyx, gynoecium, and androecium; its different pubescence on the leaves, calyx and vexillum; and its larger stipules, stipels and inflorescence. Other botanists have reached the same conclusion, as evidenced by their annotations, but they disagree on its placement. These specimens have been included in several species, including C. arborea, C. arborescens, C. glaberrima, C. javitensis, and C. racemosa (= C. fairchildiana). Sandwith (UC 606482) raised the question of a new species in his annotation. However, there are too many characteristics which agree with C. arborea to warrant its segregation from the species, even though the pubescence of some structures varies and the leaves seem to be quite different. The longer primary branches of the inflorescence suggest an affinity with var. longiramosa. But it differs in the characters previously noted, and does not agree with the length of the primary branches of var. longiramosa, being consistently shorter. Therefore, the better placement is to treat these collections as a separate variety of C. arborea.

DISTRIBUTION (Figure 16): B R A Z I L. ACRE: Near mouth of Rio Macauhan, Basin Rio Purus, 9°20'S-69°W, 27 Aug 1933, Krukoff 5719 (Paratypes: A,BM-2 sh.,F,G-2 sh.,LA,M,MICH,M0,NY-2 sh.,PR-2 sh.,PR-2 sh.,S,U,UC).

2. Clitoria fairchildiana Howard, Baileya 15: 16. 1967.  
Clitoria racemosa Benth., Ann. Wein. Mus. Natur. 2: 115.  
 1837, non G. Don (1832), nec Sessé & Mocino (1889);  
nom. inval.  
Ternatea racemosa (Benth.) Kuntze, Riv. Gen. Pl. 1: 210.  
 1891.  
Centrosema spicata Glaziov, Bull. Soc. Bot. France 53,  
Mem. 3b: 135. 1906; nom. nud.  
Clitoria racemosa Benth. f. obovatifolia Rizz., Arq. Jard.  
Bot. Rio de Jan. 17: 190. 1963.  
Neurocarpum racemosum Pohl, nom. in schedula.

Tree, commonly 3-8 m tall to occasionally reported 26 m tall, to 40 m in cultivation. Branches arching virgate, drooping to touch ground to form a canopy, pith solid, to 8 mm diameter, juvenile branches subquadrangular becoming terete, pubescence moderately uncinatate and of minute erect hairs, ca 0.25 mm long, becoming glabrate with age; bark brownish, peeling in longitudinal strips, a grayish-white beneath; axillary buds 2-3 mm; leaf scars suborbicular, bundle scars inconspicuous, stipule scar falcate. Leaves 3-foliate, coriaceous, leaflets lanceolate-elliptic to oblong-elliptic, sometimes the terminal leaflet oblanceolate to lanceolate-obovate, apex narrowing to an acumens 0.5-2 cm long, or obtuse and abruptly short acuminate in the oblanceolate-obovate leaflets, extreme apex more or less mucronate, base broadly cuneate, midrib impressed above with often minute semierect and uncinatate hairs present, primary nerves of 14-19 pairs, upper surface bright green, shiny, glabrous, lower surface pale green, with dull,

minute appressed hairs, ca 0.25-0.5 mm, more conspicuous and sometimes longer on major nerves, 6-18 (22) cm long, 3-7 cm wide, the terminal leaflet larger; juvenile leaves commonly collected, complicate, upper surface purplish, lower surface with dense white, appressed, ascending hairs, more persistent along nerves. Petioles compressed, weakly caniculate, pubescence of uncinatate and short erect hairs, 3-7 (9) cm; rachis more conspicuously compressed, 1.5-3 (4) cm. Petiolules dark brownish-black, subquadrangular, with dense erect trichomes, rusose, 5-9 mm. Stipules deciduous, lanceolate, glabrate, minutely ciliolate, apex gradually narrowed to sharp point, 6-12 mm long, 2-3 mm wide; stipels deciduous, stiff, linear, often 5-nerved, sparse pubescent, 5-12 mm long, 0.5-1 mm wide, terminal stipels usually shorter than lateral. Inflorescence axillary or terminal, rarely bearing minute leaves near base which quickly abort, solitary, multiflowered, subpaniculate, all axes with dense minute hairs, erect and uncinatate, reddish-brown, central axis twisting, subquadrangular-compressed, becoming terete with age, weakly caniculate, 8-42 cm long, primary branches which bear pedicels subsessile to 4 mm. Pedicels paired, 3-8 mm long to 4 mm thick in fruit, slightly darker in color, uncinatate-pubescent. Bracts subtending primary branches solitary, semipersistent, reflexed in age, linear-lanceolate, 6-10 mm long, 2-3 mm wide; bracts subtending pedicel 2-3, reflexed in age, ovate, acute, short strigose and ciliate, 4-8 mm long, 2-4 mm wide, middle pair persistent, outer bract deciduous. Bracteoles persistent, coriaceous oblong to elliptic, obtuse, sometimes apiculate, reddish-brown, minutely striated, pubescence of minute appressed hairs and ciliolate, large subequal and enclosing calyx, sometimes splitting near apex to form 2-4 teeth or lobes, (13)

17-23 mm long, 7-11 mm wide, inserted 1 mm below calyx. Flowers violaceous to rose, medium size, 4-6 cm. Calyx green, pubescence of scattered, minute, appressed hairs, tube 11-16 (20) cm long, 3-6 mm wide at base to 7-10 mm wide at throat, lobes ovate-deltoid, acute, 4-6 mm long, 3-4 mm wide, ventral lobe 5-8 mm x 2 mm, linear with abruptly acuminate apex. Vexillum pubescence appressed tawny, denser towards complicate fold, 3-4.5 mm wide, claw 6-8 mm. Alae oblong-falcate, extended beyond carina 5-7 mm, blade (15) 18-23 mm long, 5-8 (10) mm wide, claw 12-18 mm. Carina white, falcate, 9-11 mm across, 3-4 mm wide, claw 15-25 mm. Staminal tube glabrous, 25-32 mm long, free filaments 2-4 mm; anthers 1.25-1.5 mm long, 0.5-0.8 mm wide, Gynophore 3-4 mm; ovary pubescence dense, white appressed hairs, especially vexillarily, 14-17 mm long, 1 mm wide, style beard dense, 12-16 mm long, geniculate last 5-8 mm; stigma capitate, ca 1 x 0.5 mm, dark-colored, short hairs around base. Legume stipitate, shortly exerted beyond calyx, green drying brown, flat, glabrate with minute hairs on sutures, sutures very thick, valve straight to weakly falcate, 12-28 cm long, 2.2-3.3 cm wide, base narrow, often 8-12 mm wide; stipe 13-22 mm; beak to 8 mm; dehiscence causing valves to twist one-quarter of a turn to one turn. Seeds nearly orbicular, black, smooth, compressed to 1-2 mm thick, 11-17 mm long, 11-16 mm wide, 5-12 seeds per pod; hilum elliptic-oblong, ca 3 x 1.5 mm. Seed germination hypogean. Figures 17 and 18.

Pohl's Clitoria is characterized as a tree of coastal areas with elongate, racemose inflorescences of numerous medium-sized violaceous flowers, and shiny-green elongated leaves borne on drooping branches.

Figure 17. *Clitoria fairchildiana* - I. (a-b) leaflets, x 1; (c) inflorescence, x 1; (d) flower, x 1; (e) ala and carina, x 1; (f) gynoecium, x 1; (g) androecium, x 1. (Constantino 11857, S: a. Huber 9475, BM: b. Killip & Smith 30396, US 1463497: c-d. Pohl 2375, W: e-g.)

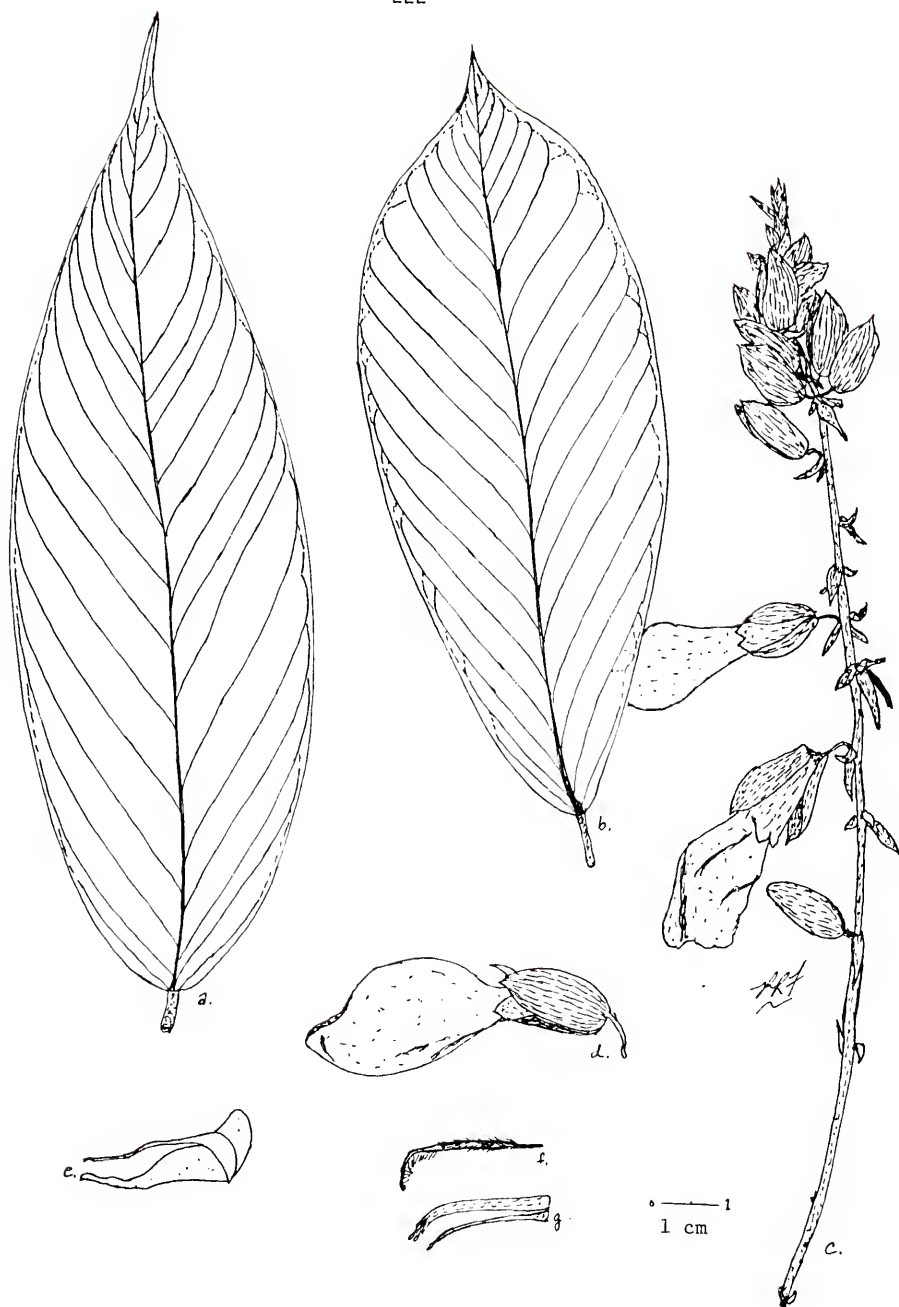
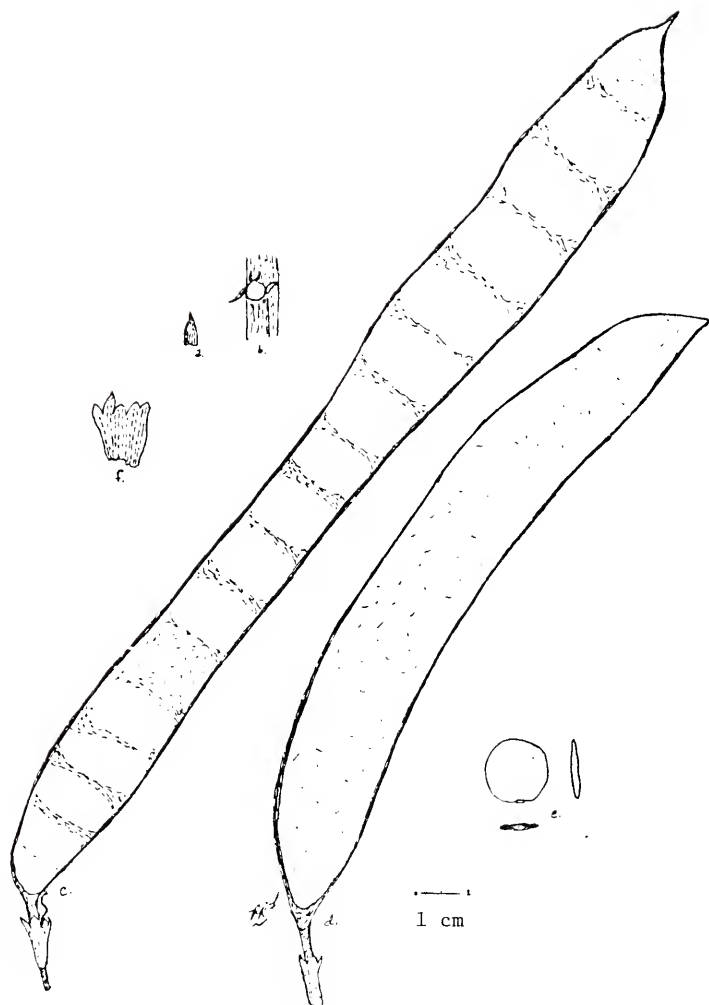




Figure 18. Clitoria fairchildiana - II. (a) stipule, x 1; (b) leaf scar and stipule scar, x 1.8; (c-d) fruits, x 1; (e) three views of seed, x 1; (f) calyx, x 1. (Pires 3110, NY: a-b. Huber 9475, BM: c. Killip & Smith 30396, US 1463497: d,f. Jimenez 5834, US 2615828: e.)



PHENOLOGY: This species has been collected in flower mainly from August to February, with isolated field collections in May & June and more commonly from cultivated plants. Fruits appear from October to February with occasional collections in May or June.

TYPE COLLECTION: BRAZIL: Natividade, 1836(?). Pohl 2375  
(LECTOTYPE: W. Isolectotypes: F 875105, K-not seen, NY,S-photo of K, and ?M-96).

Bentham described the species and cited only one collection as "Ad Natividade, Pohl." The Wein specimen bears the name Neurocarpum racemosum, which has had a line drawn through it, and "Clitoria racemosa Benth. ipse" written above the name. The New York specimen is a duplicate from Wein with the pair of names and the phrase "fide Bentham" written in a blue ink, much fresher than the Wein specimen, and presumably labeled at a later date. The ink does not appear to be the iron-based ink used on the Wein specimen. All other collections examined bear only Bentham's name and lack any indication that Bentham may have examined them. The Kew specimen is marked "Hb. Benthamianum, 1854," thus probably was observed by Bentham; however, the specimen was placed in Bentham's herbarium seventeen years after he had described the species and is thus an isotype. The Wein specimen was selected as the lectotype because it is more probably the type specimen from which Bentham described his species.

Bentham neglected to include the collection number "2375" which is present on the Wein label and its duplicates. Bentham had failed to cite collection numbers in other species of the same publication. The date 1836 appeared only on the label data of the Kew specimen.

Bentham's name was a homonym for G. Bon's name published in 1832, and is thus invalid. Howard (1967) correctly noted this and proposed the substitution of the name C. fairchildiana (after David Fairchild whom Howard believed introduced the species into the Montgomery Foundation Property at the Fairchild Gardens in Miami, Florida, USA). Howard cited the type specimen of Pohl, but a year later distributed specimens from the tree on the Montgomery Property as the "type tree" (Howard 17052), which it is not. The type tree is in Natividade, Brazil; and was probably a cultivar since it was located outside of its coastal range.

Glaziou (1906) had published the nomen nudum, Centrosema spicata, which has not been synonymized previously. A Kew specimen (K-427!) bears the label "no. 9738, comm. M. Glaziou, Dec. 1878. Cultivated at Rio Janeiro" and a notation in pencil "Centrosema spicata Glaziou, n. sp., nomen in 'Liste' ex no." The specimen is Clitoria fairchildiana, which is commonly cultivated in Rio de Janeiro, and may possibly be the type of the nomen nudum, Centrosema spicata Glaziou. Therefore, it is included as questionable in the synonymy of C. fairchildiana.

VERNACULAR NAMES: BRAZIL: Facao, Pires & Cavalcante 52540 (Amapá); Faveira or Palheteira, Ducke 350 & 614 (Para).

ECONOMIC IMPORTANCE: The species is cultivated as an exotic ornamental tree, particularly in Rio de Janeiro, less commonly in other areas.

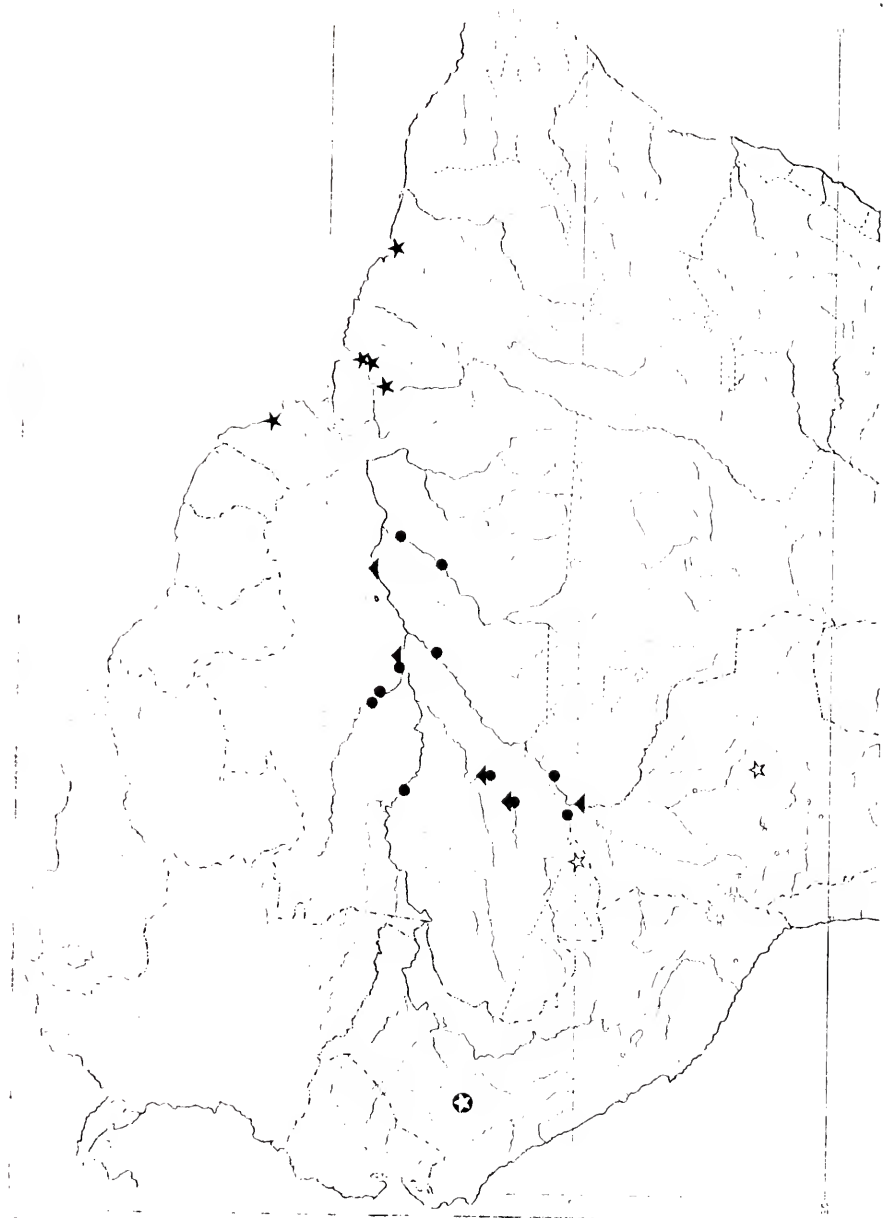
NOTES: Rizzini (1963) described f. obovatifolia based upon one specimen (Schwacke 245, holotype: RB 38376!) with the leaflets in a packet, some of which were larger and obovate. This author has seen other collections in which the same plant will have some terminal

leaflets obovate, with the other terminal leaflets more typical. With the variation on a single plant and the narrow range of distribution, this form is not recognized.

DISTRIBUTION (Figure 19): The species is endemic to the deltas of northeastern Brazil, although it is cultivated in other parts of Brazil, the West Indies, Florida (USA), and Philippines.

B R A Z I L. WITHOUT LOCALITY: Burchell 8084 (GH,K) and 8227 (GH,K); Pohl (M). AMAPÁ: Calcoene, coastal region, 21 Aug 1962, Pires & Cavalcante 52540 (F,G,GH,MICH,NY,RB-2 sh.,VEN). PARA: Morajo, in ripa fluv. Laranjeiras, 1877, Schwacke 245 (RB); Ilha do Mosqueiro, 27 Jun 1930, Bastas 13 (FLAS, RB-not seen); l.c., 17 Oct 40, Ducke 350 (S) and 614 (F,MO,NY,UC); l.c., sandy coast, 3-9 Nov 1929, Killip & Smith 30396 (NY,US); l.c., ad fluv. Para, cult. Jard. Bot. Rio de Janeiro, 11 Feb 1928, Constantino 11857 (RB,S,U); arredores do Belém, Oct 1906, Snethlage 7740 (RB); cult. Belém, 27 Jan 1952, Black 52-14147 (P); l.c., grounds Museum Goeldi, 2 Oct 1961, Egler & Irwin 46712 (NY-2 sh.); margem do Rio Guamá, 11 Jan 1951, Pires 3110 (NY); l.c., Sep-Oct 1961, Pires 51923 (NY,U); margin Rio Tocantins, 14 May 1951, Froés 27068 (NY); Ilha Arapiranga, Dec 07, Huber 9475 (BM,G-2 sh.); near Trapiche Hypolito, 24-5 Aug 1934, Krukoff 5877 (A,BM,F,MICH,MO, NY,S,U,US); Tapana (?), Hoffmannsegg s.n. (HAL). MARAHAÏÃO: Rio Itapecuri-Parnahiba, Dec 1884, Capaneura s.n. (RB); Rio de Pedreiras, 22 Jun 1909, Anonymous 2286 (BM,G,RB). GUANABARA: cult. Rio de Janeiro, Glaziou 9738 (K); l.c., Kuhlmann s.n. (RB-2 sh.); l.c., 2 Dec 1934, Lage 152 (RB); l.c., 17 Mar 1936, Lage RB-81425 (FLAS,RB-not seen); l.c., 8 Nov 1960, Costa RB-166600 (FLAS,RB-not seen); l.c., 25 Feb 1932, Pessoal 2414 (RB-2 sh.); Rio de Janeiro pr. Reserva

Figure 19. South American distribution of four species of section Bractearia. *Clitoria amazonum* f. *amazonum* (▲), f. *vulgaris* (●); *C. fairchildiana* (★); *C. moyobambensis* (☆); *C. nervosa* (☆).



Biológica, 28 Dec 1965, Moreira 85 (US); Rio de Janeiro, Itanhanga Golf Club, Feb 1962, Silva 24 (FLAS, RB-not seen).

V E N E Z U E L A. cult. in Parque del Este, Caracas, Jun 1972, Steyermark s.n. (US).

D O M I N I C A N   R E P U B L I C. cult., Estancia Nueva, Moca, Espaillat prov., 28 Jun 1970, Jiménez 5834 (NY-2 sh., US-2 sh.).

U N I T E D   S T A T E S. FLORIDA: Dade Co.: Miami, cult. Montgomery Foundation, 28 Oct. 1968, Gillis 7030 (S); cult. Fairchild Trop. Garden, 1 Jul 1969, Gillis 8311 (US); cult. Jennings Estate, 30 Jun 1968, Howard 17052 (HAL-2 sh.). Martin Co.: cult., 14 Jun 1967, Campbell s.n. (FLAS).

P H I L I P P I N E S. cult. some gardens, 28 Apr 1965, Pancho 6572 (US).

3. Clitoria andrei Fantz, sp. nov.

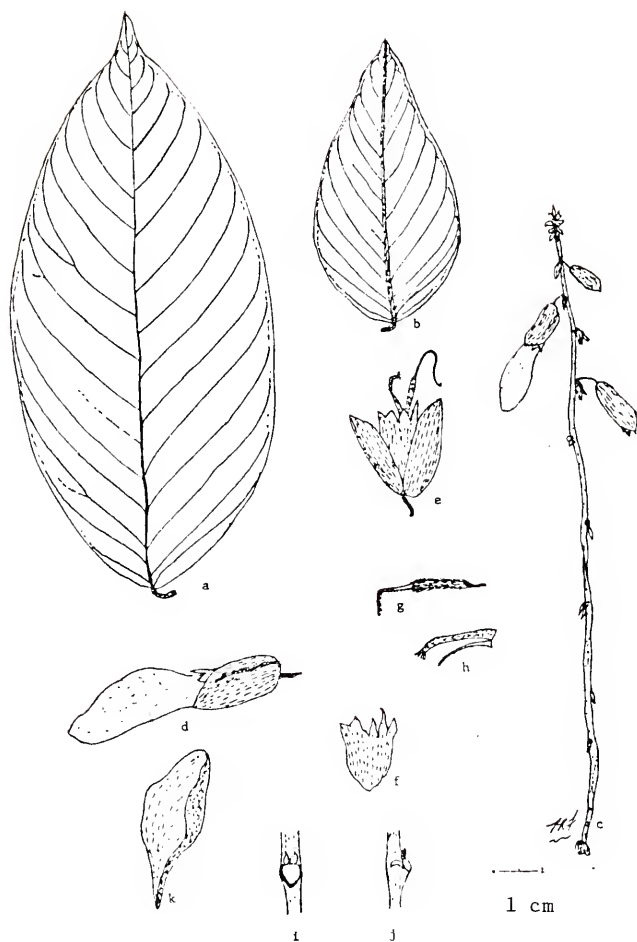
Tree, 20 m tall. Branches subquadrangular, becoming terete, to 7 mm diameter, pith hollow, juvenile short appressed to spreading hairs, becoming glabrate; bark light brown; axillary buds 1.5-2 mm, bud scales ovate, acute, strigose, concave; leaf scar suborbicular, bundle scars inconspicuous, stipule scar falcate. Leaves coriaceous, 3-foliate, leaflets ovate-lanceolate to elliptic-lanceolate, apex abruptly acuminate, acumen 1-2 cm, mucronate, base broad cuneate to rotund, midrib impressed to subimpressed above, often bearing short erect hairs, primary nerves 13-17 pair, upper surface dark green, glabrous, lower surface pale green, short subvelutinous with semiappressed hairs along nerves, 7-20 cm long, 3-8 cm wide. Petiole subangular-terete to



compressed above, 4-7 cm, pubescence of short spreading hairs, rachis subquadrangular, 1-2.5 cm. Petiolules quadrangular, medium-colored, dense falcate hairs, 6-7 mm. Stipules deciduous, deltoid, acute, 4 mm long, 3 mm wide; stipels deciduous, linear, pubescence short, appressed, 2-5 mm long. Inflorescence elongate, subpaniculate-racemose, axillary or terminal, solitary, multiflowered, axes with dense, short rufous-trichomes on juvenile parts, becoming less dense and whitened with age towards base, central axis 7-20 cm, primary branches which bear pedicels subsessile to 2 mm. Pedicels paired, 6-8 mm. Bracts ovate, acute, dense pubescence of rufous trichomes, reflexed in age before dropping, 4-6 mm long, 1.5-2 mm wide; middle pair persistent; outer bract narrow, semipersistent. Bracteoles large, coriaceous, conspicuous, oblong, obtuse subequalling the calyx, pubescence appressed, 22-25 mm long, 9-12 mm wide. Flowers "livido-roseis," 4-5 cm. Calyx pubescence of scattered, short appressed hairs, tube 14-16 mm long, 4-5 mm wide at base to 9-11 mm wide at throat, lobes deltoid, 5-7 mm long, 2-3 mm wide, ventral lobe 6-8 mm. Vexillum indumentum of short, tawny, appressed hairs, 2.5-3 cm wide, claw ca 12 mm. Alae extended beyond carina 6-8 mm, blade ca 16-18 mm long, 4-6 mm wide, claw ca 15-17 mm. Carina falcate, ca 9 mm across, 3-4 mm wide, claw ca 24-27 mm. Staminal tube sparsely uncinat-pubescent near apex, 28-30 mm long, free filaments sparsely uncinat, 2-3 mm; anthers 1.5-2 mm long, ca 0.3 mm wide, connective acuminate. Gynophore 3 mm; ovary pubescence of dense, appressed, yellowish-white trichomes, ca 14 mm long, 1.25 mm wide; style 17-21 mm, geniculate 6-7 mm from distal end; stigma flat, discoid, 0.5 mm diameter, base pubescent, erect. Legume unknown.

Figure 20.

Figure 20. *Clitoria andrei*. (a-b) leaflets, x 1; (c) inflorescence, x 1; (d) flower, x 1; (e) bracteoles and calyx with beginning fruit, x 1; (f) calyx, x 1; (g) gynoecium, x 1; (h) androecium, x 1; (i) leaf scar, x 1.2; (j) stipule scar, x 1.2; (k) vexillum, x 1. (Andre 4675, F 537681: a,d-k; GH: b-c.)



Andrei's Clitoria is characterized as an Ecuadorian tree with subvelutinous leaves, elongate inflorescence of many medium-sized flowers with large, coriaceous bracteoles, and short stipules & stipels.

PHENOLOGY: One collection was obtained in flower in July.

TYPE COLLECTION: ECUADOR. Inter Guayaquil and Santa Rosa, 60 m, July 1876, Andre 4675 (HOLOTYPE: GH. Isotypes: F 537681, K-438, NY).

All four sheets are very similar, but the Gray Herbarium specimen was selected as the type because it has a dissected flower plus both flowers' and leaves are attached to the inflorescence and branches, as opposed to their being placed in packets.

VERNACULAR NAME: Sapotillo, Andre 4675.

NOTES: This collection was identified as C. amazonum from which it differs in many characteristics. It is easily distinguished by the inconspicuous primary branches of the inflorescence, smaller flowers, most floral structures, and leaves. Clitoria andrei has its closest affinities to C. juninensis, a Peruvian endemic, which is a shrub with smaller bracteoles, conspicuous primary branches in the inflorescence, and larger stipules and stipels.

DISTRIBUTION (Figure 16): This species is known only from its type location in Ecuador.

4. Clitoria juninensis Fantz, sp. nov.

Shrub, erect, 2-4 m tall. Branches elongated (vide Killip & Smith 23380), to 10 mm thick, pith hollow, juvenile branches subangular with densely spreading, rufous hairs, branches darkening with age, terete, glabrate with uncinat trichomes becoming more conspicuous; bark brown,

splitting longitudinally, lightened beneath; axillary buds 1-2 mm, scales glabrate; leaf scar elliptic to shield-shaped, bundle scars more or less inconspicuous, broad lyriform, stipule scars falcate. Leaves 3-foliate, coriaceous, leaflets broad elliptic to ovate-elliptic to obovate, apex generally obtuse, rapidly narrowed to a short acumen 1-7 mm long, more or less mucronate, base broad cuneate to rotund, midrib impressed above, glabrous or bearing short erect or uncinat hairs, primary nerves of 10-16 (-18) pairs, upper surface slightly dark green and glabrous, lower surface pale green and subvelutinous, 8-22 cm long, 4-9 (12.5) cm wide. Petiole subangular-terete, ribbed, with moderately dense, short spreading, rufous trichomes, 4-11 cm; rachis more compressed, (1.5) 2-3.5 cm. Petiolule dark-colored, subquadrangular, with dense, spreading rufous trichomes, 6-10 mm. Stipules deciduous, densely pubescent, rufous, ciliate, lanceolate-deltoid, gradually narrowing to acute apex, 8-11 mm long, 2-3 mm wide; stipels semideciduous, linear, gradually narrowed to acute tip, 5-10 mm long, 0.2-0.7 mm wide. Inflorescence subpaniculate-racemose, axillary and terminal, solitary, multiflowered, pubescence of axes short, moderately dense to dense, spreading, rufous, central axis 5-23 cm long, lignose and nodose in fruit, primary branches which bear pedicels subsessile to 5 (8) mm long. Pedicels paired, 4-7 mm. Bracts ovate, acute, reflexed in age, pubescence dense, appressed, rufous, ciliate, 4-7 mm long, 2-3 mm wide, middle pair persistent, outer solitary, slightly narrower, deciduous; bract at base of primary branch solitary, semipersistent, narrower. Bracteoles large, coriaceous, oblong-elliptic, subequal calyx, pubescence short, appressed, 14-18 (20) mm long, 7-10 mm wide. Flowers white to pink vexillum tinged blue with a blue carina,

4-5.5 cm, calyx pubescence appressed, tube 13-17 mm long, 3-5 mm wide at base to 8-12 mm wide at throat, lobes ovate-deltoid, acuminate, 5-7 mm long, 3-4 mm wide, ventral lobe 7-8 mm, narrow. Vexillum pubescence tawny, short appressed, 3-3.5 cm wide, claw ca 9 mm. Alae white-pink, extending beyond carina 6-8 mm, blade 18-23 mm long, 5-9 mm wide, claw 13-15 mm. Carina blue, falcate, 9-13 mm across, 4 mm wide, claw 24-27 mm. Staminal tube glabrous, 27-32 mm, free filaments 3-5 mm; anthers 1.5-1.75 mm long, 0.5-0.75 mm wide. Gynophore 3 mm; ovary pubescence dense, appressed, yellowish-white, ca 14 mm long, 1.25 mm wide; style 16-17 mm, geniculate 6-7 mm from the distal end; stigma flattened, diameter ca 1 mm, base short, erect pubescence. Legume stipitate, slightly exerted beyond calyx, greenish-brown, flat, glabrous, sutures thick, 21 cm long, 2.5-3.2 cm wide; stipe 14-17 mm; beak to 4 mm; dehiscence causing valves to twist one-half of a turn. Seeds nearly orbicular, black, smooth, compressed, 1-2 mm thick, ca 10 mm long, 9 mm wide, 7 seeds per pod; hilum linear, 3 mm x 1 mm. Figures 21 and 22.

The Junin Clitoria is characterized as a tall Peruvian shrub with elongate subpaniculate inflorescences of many medium-sized, blue and pinkish-white flowers which possess the large coriaceous bracteoles of a smaller size, and subvelutinous leaves, shortly acuminate, with larger stipules and stipels.

PHENOLOGY: Flowers have been collected from late May to early June and from mid January to February, with one collection from mid October. Mature fruits were collected in early June.

TYPE COLLECTION: PERU. Shrub, 8-12 ft, with elongated branches; standard and wings white, blue-tinged, keel blue, white proximally, La

Figure 21. Clitoria juinensis - l. (a-b) leaflets, x 1; (c) inflorescence, x 1; (d) calyx, x 1; (e) vexillum, x 1; (f) ala and carina, x 1; (g) androecium, x 1; (h) gynoecium, x 1; (i) stigma and style apex, x 5. (Isern 2440, F 1575131: a-b. Ferreyra 13555, WIS: c-i.)

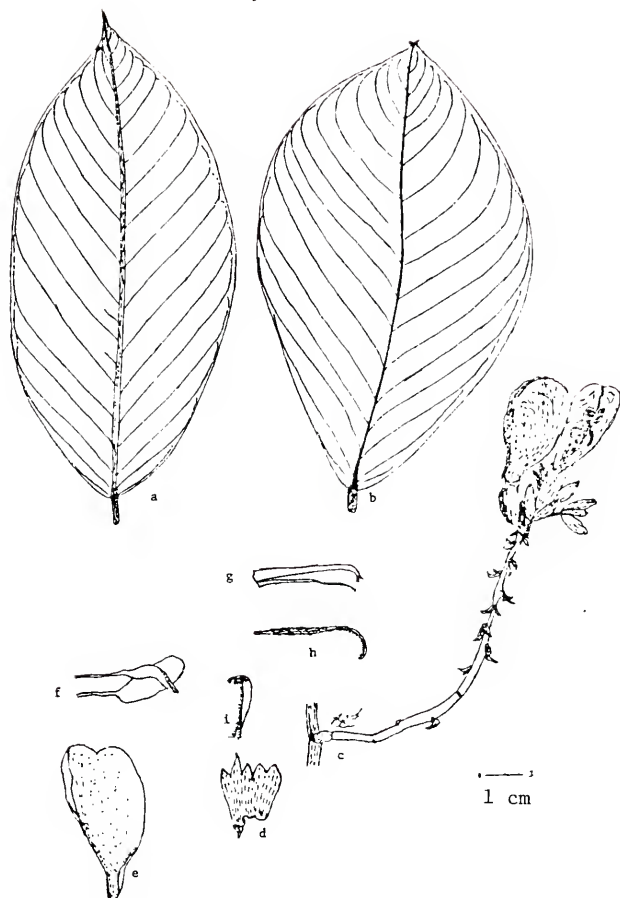
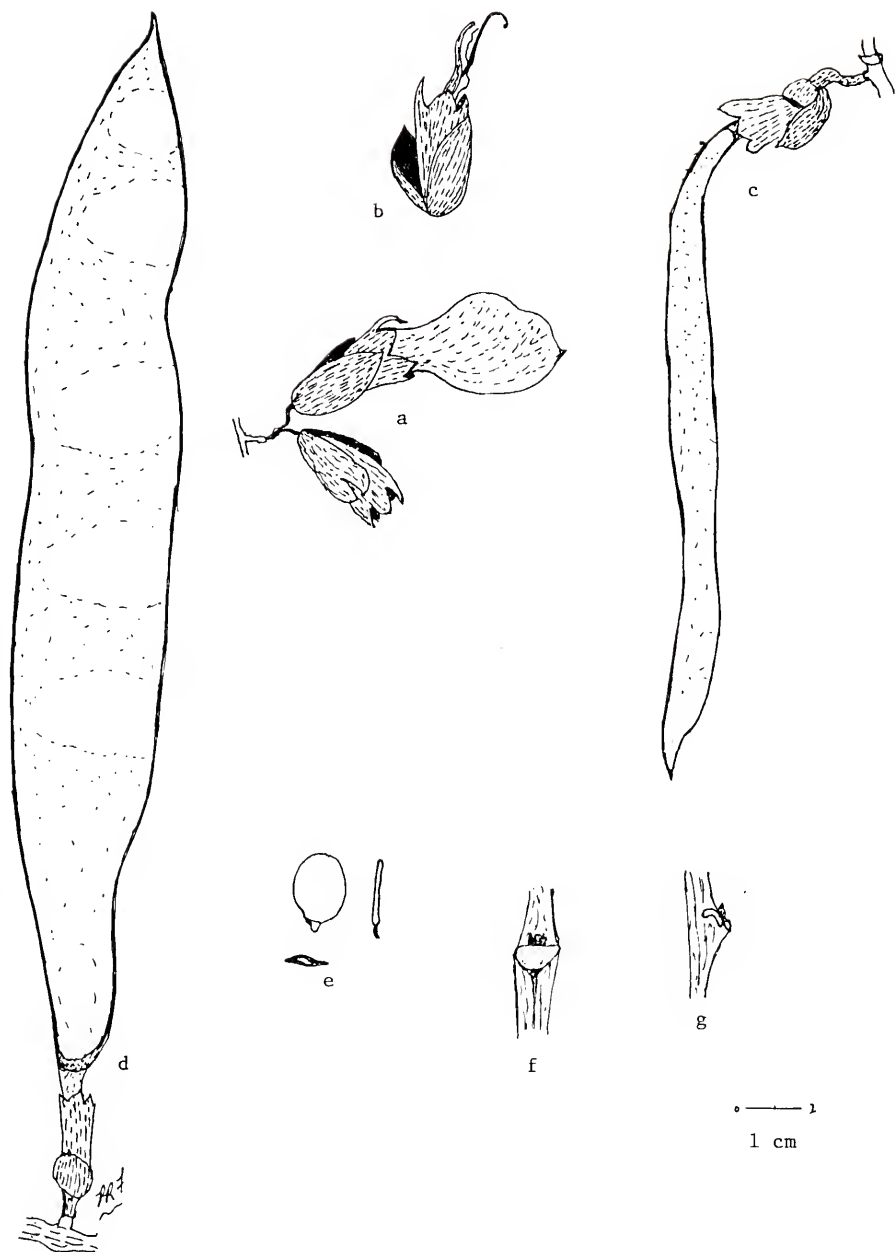




Figure 22. Clitoria juinensis - II. (a) pair of flowers at a node, x 1; (b) bracteoles and calyx with beginning fruit, x 1; (c) immature fruit, x 1; (d) mature fruit, x 1; (e) three views of seed, x 1; (f) leaf scar, x 1; (g) stipule scar, x 1. (Killip & Smith 23380, NY: a,f. Ferreira 13555, WIS: b,d. McLean s.n., K-445: c. Killip & Smith 25136, NY: e,g.)



Merced, Dept. Junín, 700 m, 29 May-4 Jun 1929, Killip & Smith 23380  
(HOLOTYPE: NY. Isotypes: F 616214, US 1358082).

Specimens varied from early to late flowering stages. The Killip & Smith 23380 collection was an intermediate stage in full bloom plus the collectors had recorded some field observations, thus it is selected as the type collection. The New York specimen has better flowering material.

The Killip & Smith 25136 (NY) specimen lacked an inflorescence and flowers, but it has a dehiscent fruit plus the only seed seen. Therefore, this specimen is selected as a paratype. Another collection (from Wisconsin) came to this author's attention nine months after the description of the species had been written. Sheet one of Ferreyra 13555 (WIS) had better material of the inflorescence, flowers, and a fruit. Sheets two (WIS) had vegetative material. Although this specimen was not used in writing the original description, measurements of a dissected flower placed in the packet plus measurements of other structures were used to supplement the description of the species. With the exception of lacking seeds, this pair of sheets has the best representative material for the species; therefore, it is selected as a second paratype collection.

ECONOMIC IMPORTANCE: One collection, Ferreyra 13555, reported the species as a cultivar.

NOTES: Most of the collections were identified as C. nervosa and cited by Macbride (1943) under this name in his "Flora of Peru." Clitoria nervosa (absent in Peru) can be easily distinguished by its smaller flowers, shorter pilose calyx, and narrower fruit. Clitoria juninensis has also been misidentified as C. racemosa (a synonym of

C. fairchildiana) and C. arborea. Clitoria fairchildiana (absent in Peru) can be distinguished by its Atlantic coastal habit, elongate glabrate leaves, and its larger bracteolate, violaceous flowers. Clitoria arborea is easily recognized by its elongated primary branches.

The closest affinities are with C. andrei of Ecuador, which has elongated acuminate leaflets, shorter stipules and stipels, slightly larger flowers with bigger bracteoles.

DISTRIBUTION (Figure 16); This species is a highland shrub, apparently endemic to the Department of Junín in Peru, and found in forests and thickets at elevations of 600-2000 m. P E R U. LOCALITY UNKNOWN: Pavon s.n. (G); Vita, hb. Hooker, McLeeins s.n. (K); Manchamayo, 16 Oct 1863, Isern 2440 (F) and 2441 (F). JUNÍN: La Merced, 700 m, 29 May-4 Jun 1929, Killip & Smith 23413 (NY,US); forest clearing along Río Perene, near "Hacienda 3," Colonia Perené, 600 m, Killip & Smith 25136 (PARATYPE: NY); Pampa Whaley, Colonia Perené, prov. Tarma, 700-750 m, 14 Feb 1959, Ferreyra 13555 (PARATYPE: WIS-2 sh.); road between Tarma and San Ramon, at Oreja Capelo, 1500-2000 m, 13 Jan 1945, Hodge 6253 (F); Chanchamayo Valley, 1000 m, Feb 1924-27, Schunke 307 (F).

5. Clitoria moyobambensis Fantz, sp. nov.

Tree. Branches 4-7 mm diameter, pith hollow, juvenile branches subquadrate, longitudinally striate and sulcate, grooves shallow to deep, pubescence uncinata and short falcate to subappressed trichomes, branches becoming subterete, glabrous with age; bark medium gray, splitting into longitudinal strips, whitish-tan beneath; stipule scars

compressed, "s-shaped," extending a third to half way around stem.

Leaves 3-foliate, coriaceous, leaflets elliptic-lanceolate, tapering to acuminate apex, acumen 1.5-3 cm long, to 1.2 cm wide at base, base broad cuneate, midrib impressed above, uncinat-pubescent, primary nerves of 13-16 pairs, upper surface dark green, glabrate with pubescence sometimes of uncinat or short erect trichomes on major nerves, lower surface light green, glabrous, 12-15.5 cm long, 6-8 cm wide. Petioles conspicuously twisted at base, longitudinally striate and caniculate, pubescence scattered, minute, falcate to appressed, 4-5 cm; rachis similar, 4 cm. Petiolules quadrangular, dark-colored, rugose, pubescence similar to petiole, 8-9 mm. Stipules large, conspicuous, concave nearly half way around stem, lanceolate-ovate, rapidly tapering above middle to acute apex, 10-12 mm long, 4-6 mm wide; stipels caducous (?), one terminal stipel seen, 2 mm x 0.4 mm.

Inflorescence axillary and terminal, subpaniculate-racemose, solitary, multiflowered, axes pubescence subappressed, moderately appressed, central axis twisting, longitudinally striate and caniculate, to 4 cm (juvenile ?), primary branches which bear pedicels subsessile, 1 (2) mm. Pedicels paired, 8-14 mm. Bracts large, conspicuous, lanceolate, short acuminate, middle bracts paired, pubescence minute, appressed, 8-11 mm long, 3-5 mm wide; inner and outer bracts not observed, caducous (?). Bracteoles large, coriaceous, multi-striated, pubescence appressed, ciliolate, oblong-elliptic, apex obtuse or abruptly apiculate, subequal calyx, 12-15 mm long, 9-10 mm wide. Flowers medium size, 4-5 cm, color unknown (dried state similar to that of C. flexuosa and C. pozuzoensis which are lilac-rose to white). Calyx glabrate, very sparse appressed pubescence, multinerved and subimpressed, inconspicuous, tube 13-15 mm

long, 4-6 mm wide at base to 8-10 mm wide at throat lobes deltoid, acute, 5-6 mm long, 4 mm wide, ventral lobe 7 mm long, 2 mm wide. Vexillum pubescence moderately dense, appressed, tawny, claw ca 11 mm. Carina and alae hidden and/or torn, thus measurements unknown. Staminal tube glabrous, 27-28 mm, free filaments 1-3 mm; anthers 0.75 mm long, 0.5 mm wide. Gynophore ca 5 mm; ovary pubescence dense, of uncinat plus 1 mm ascending trichomes along dorsal and ventral edges, ca 13 mm long, 1 mm wide; style ca 14 mm long, geniculate 6 mm; stigma dark-colored, subflattened, ca 0.7 mm diameter, base with ring of dense, short reflexed trichomes. Legume unknown. Figure 23.

The Moyobamba Clitoria is characterized as a tree with conspicuously large bracts and stipules, medium-sized flowers with an uncinat pubescent ovary, and large bracteoles that subequal the calyx.

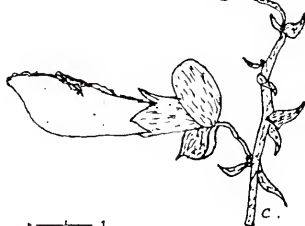
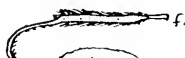
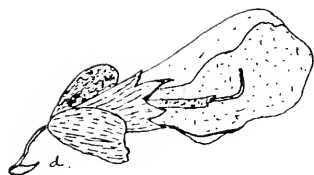
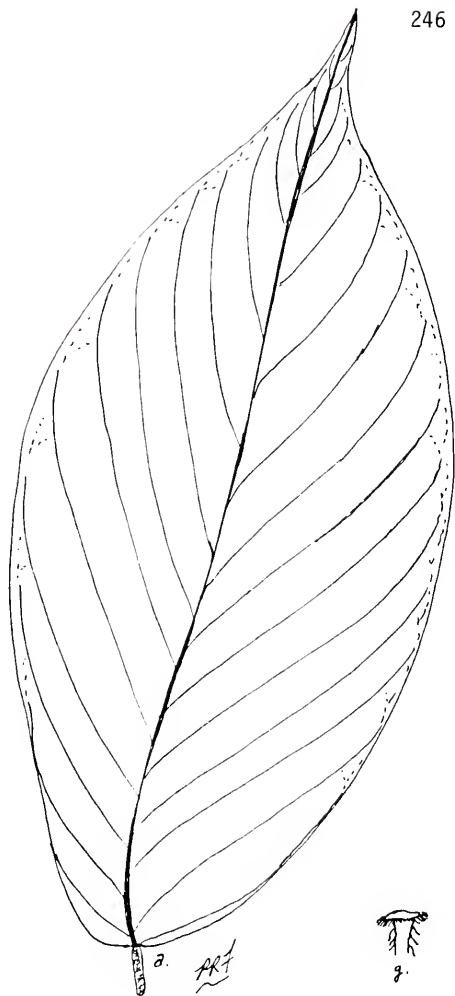
PHENOLOGY: Flowering dates are unknown.

TYPE COLLECTION: PERU. prov. Moyobamba, 1838, Mathews s.n.  
(HOLOTYPE: K-439, hb. Hookerianum of 1867).

This specimen was identified as C. hoffmannseggii (a synonym of C. arborea) which is easily recognized as differing by the elongated primary branches, larger bracteoles, and smaller bracts and narrower stipules. This specimen is unique in the size of its bracts and stipules and the pubescence of the ovary. Its closest affinities appear to be with C. andrei and C. juninensis based upon the size of several floral structures and the similar stigma.

DISTRIBUTION (Figure 19): This species is known only from the type collection of prov. Moyobamba, Peru.

Figure 23. Clitoria moyobambensis. (a) leaflet, x 1; (b) portion of stem with stipules and stipular scar, x 1; (c) inflorescence, x 1; (d) flower, x 1; (e) calyx, x 1; (f) gynoecium, x 1; (g) stigma, x 1. (Mathews s.n., K-439: a-g.)



1 cm



6. Clitoria amazonum Mart. ex Benth., Ann. Wein. Mus. Natur.  
2: 115. 1837.

Clitoria acuminata Benth., Ann. Wein. Mus. Natur. 2:  
1837, non Graham (1828); nom. illeg.

Clitoria mucronulata Benth., Ann. Nat. Hist. 3: 345. 1839.

Ternatea amazonum (Mart. ex Benth.) Kuntze, Riv. Gen. Pl. 1:  
210. 1891.

Bractearia amazonica Mart., nom. in schedula.

Clitoria amazonica Mart. a. Benth., nom. in schedula.

Erect shrub to small tree, 1-4 m tall, occasionally to 8 m, apex rarely reported as climbing. Branches elongate, lax, apically compressed with longitudinal caniculi, becoming subquadrangular then terete, juvenile branches with pubescence short, spreading, becoming glabrous, pith solid to sometimes minutely hollow, diameter 2-3 mm; axillary buds 3-5 mm; stipule scars elliptic, bundle scars inconspicuous, stipule scars falcate; bark brownish-black, peeling in longitudinal strips, light-colored beneath. Leaves 3-foliate, coriaceous, leaflets variable, generally ovate to ovate-elliptic to ovate-lanceolate with lateral leaflets sometimes round, nearly orbicular or slightly longer than broad, apex acuminate, acumen 0.5-2.5 cm, mucronate, base broad cuneate to rotund, rarely weakly cordate, midrib impressed above with numerous short spreading hairs, primary nerves (6-9 orbicular leaflets) 8-13 pair, upper surface glabrous, lower surface with moderately dense, short pilose hairs from nerves, 4.5-15 cm long, 3-8.5 cm wide. Petiole slightly compressed, longitudinally grooved, pubescence of few, short appressed hairs, 2-8 cm; rachis 1.5-3.5 cm. Petiolules dark-colored,

subquadrangular-terete, bearing short, erect, white hairs, especially adaxially, 5-8 mm. Stipules ovate-deltoid, acute, deciduous, pubescence sparse, short-ciliate near apex, 2-5 mm long, 2-3 mm wide; stipels linear to awl-shaped, pubescence sparse, 2-5 mm long, less than 0.5 mm wide, terminal stipel always shorter. Inflorescence axillary or terminal, paniculate, solitary, multiflowered, axes with dense reddish-brown, appressed pubescence, central axis rarely bearing small leaves near base, deciduous, longitudinally grooved and striated, 2-8 cm long, primary branches that bear pedicels conspicuous, 4-16 mm long, swollen at apex. Pedicels paired, 6-12 mm. Bracts variable; bracts subtending primary branch paired, ovate, acute, deciduous, 2-3 mm long, 1-2 mm wide; bracts subtending pedicel, middle pair persistent, ovate, acute, pubescence dense, appressed, concave, reflexed in age, 4-8 mm long, 3-6 mm wide, inner pair caducous, outer bract narrower, deciduous. Bracteoles large, coriaceous, elliptical, obtuse to short apiculate, minutely striate, pubescence concentrated near base, nearly glabrous towards apex, scattered, minute, appressed, subequaling calyx, 20-28 mm long, 9-16 mm wide. Flowers large sized, 6-8 cm, pale violet or rose to white, medial lines dark violet. Calyx glabrate, with sparse appressed hairs, tube 16-25 mm long, 5-7 mm wide at base to 9-13 mm wide at throat, lobes deltoid, 5-7 mm long, 4-5 mm wide, acute, ventral lobe slightly pubescent, 6-8 mm long, 2-3 mm wide. Vexillum pubescence glabrate, of minute appressed hairs concentrated near complicate fold, 4-6 cm wide, claw 12-16 mm. Alae oblong and falcate near middle extending beyond arina 8-11 mm, blade 28-34 mm long, 4-8 mm wide, claw 19-28 (34) mm long. Carina falcate, 13-17 mm across, 5-6 mm wide, claw 28-44 mm. Staminal tube glabrous, nearly straight to subfalcate,

35-43 (48) mm long, free filaments 3-5 mm; anthers 2-3 mm long, 0.5-0.8 mm wide. Gynophore 6-7 mm; ovary pubescence dense, appressed, white, less dense in center than at margins, elongated, 22-28 mm long, 1.5 mm wide; style 14-27 mm, geniculate 6-9 mm from distal end; stigma capitate. Legume nearly straight, stipitate, shortly exerted beyond calyx, flat, coriaceous, glabrous except for slightly thickened sutures which bear short, spreading to erect hairs, 10-27 cm long, 1.3-1.9 (2.1) cm wide; stipe elongate, 24-51 mm long, 3 mm wide expanding to 6 mm at apex; beak 1-7 mm; dehiscence 1-1.25 turns. Seeds black, nearly orbicular, compressed, 1-2 mm thick, smooth, 8-10 mm long, 9-10 mm wide, 10-17 seeds per pod; hilum minute, linear, 2 mm x 0.5 mm. Seed germination hypogean. Figure 24.

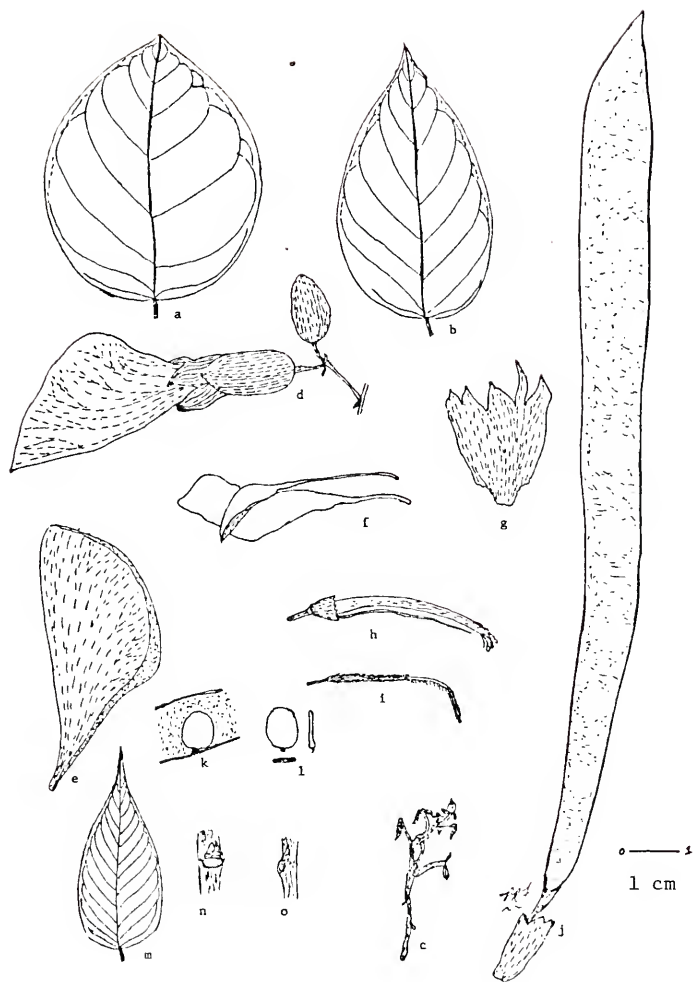
Martius' Amazon Clitoria is characterized as a tall shrub to small tree with large bracteoles subequalling the calyx, with conspicuous elongated primary branches in the inflorescence, and with large flowers.

PHENOLOGY: Flowers have been collected in two periods, May to July and September to December. Fruits have been collected in June and July, and occasionally in November.

TYPE COLLECTION: BRAZIL. Pará, ad. fluv. Amazonum prope Ponte de Mattary, Sept., Martius 2740 (LECTOTYPE: M 12410! Isolectotypes: K-hb. Hooker, not seen; M 12408!, 12409!, 12411!, 12412!, 12413!; A! and S!, each a photo of K).

Bentham originally described C. amazonum as having suborbicular lateral leaflets. He cited two syntype collections as: (1) "In sylvis ad fluv. Amazonum, prope Conta de Mattury, provinciae Para, Martius" and (2) "Ega Amazonum, Pöppig." Only the Martius specimens have suborbicular lateral leaflets. Six sheets of the Martius collection at

Figure 24. Clitoria amazonum. f. amazonum: (a-b) lateral leaflets, x 1; (c) inflorescence, x 1; (d) flowers, x 1; (e) complicate vexillum, x 1; (f) ala and carina, x 1; (g) calyx, x 1; (h) androecium, x 1; (i) gynoecium, x 1; (j) fruits, x 1; (n) leaf scar, x 1.8; (o) stipule scar, x 1.8. f. vulgaris: (k) seed within fruit, x 1; (l) three views of seed, x 1; (m) lateral leaflet, x 0.5. (Ducke 8650, RB 11843: a. Prance et al. 14138, M -7: b-i. Prance et al. 6597, S: j,n-o. Prance et al. 6194, S: k-l. Prance et al. 8178, NY: m.)



München are numbered consecutively from 12408 to 12413, each stamped "vid. Benth." Only the first sheet (M 12408) bears both the names Bractearia amazonica Mart. and Clitoria amazonica, whereas the remaining five sheets bear only the last name. The Martius collection matches the original description plus it bears the unpublished basionym of Martius upon which Benth. selected the specific epithet and the original names for the section. Therefore, the Martius collection was selected over the Pöppig collection as the lectotype for the species.

Of the eight sheets of the Martius collection, the München specimens were known to have been seen by Benth. and they were the probable source for the species epithet. With their consecutive numbers and enclosure in one folder, the six sheets are treated as equivalent. Two specimens are mostly vegetative (M 12408 & 12411), the other four specimens nearly the same. Since the International Code of Botanical Nomenclature recommends the selection of a single sheet for the type, the specimen numbered "M 12410" was selected as the lectotype because it has inflorescences, flowers, and a dissected flower inside the mounted packet.

Benth. neglected to cite the collection number of the Martius specimens, although the number "2740" was present. This was typical of Benth. in his citations for other species in his publication. In addition, he altered the spelling of "Ponte de Mattary" (label data) to "Conta de Mattary" in his publication. This raises the question of another change in spelling, the alteration of the ending of the specific epithet. The type specimens bear the name "amazonica" whereas Benth. (1837) published the original name as C. amazonum. The ending "-um" usually indicates the masculine or neuter gender, not feminine. In

1858 and 1862, Bentham again published the species as C. amazonum. In comparing these three treatments, it is apparent that Bentham rewrote the descriptions rather than recopy his data from the earlier publication. Since Bentham twice failed to change the name from C. amazonum to C. amazonica, it seems that he intended the name to be C. amazonum. Based upon two Latin works, Stearn (1966) and Cassel (1959), "Amazonum" is the feminine genitive plural noun of the term "Amazon." It is believed that Bentham meant the basionym to be a possessive noun in the plural, to include all the clitorias of the Amazon, which would include the Rio Amazonas and its major tributaries, such as the Rio Solimões and Rio Negro, as he cited in his distribution in 1858. Therefore, in this particular case, the term "Amazonum" is feminine and the "-um" is a proper ending which is in agreement with the generic name Clitoria.

The name C. acuminata Benth. was a homonym of Graham's name published in 1828, therefore an invalidly published name. Bentham (1858) reduced the name as a synonym of C. amazonum. Bentham cited one collection as: "Ad flum. Amazonum ripas, locis sylvaticis provinciae Rio Negro, Martius." Two München sheets of this collection have been examined. They match the type except in lateral leaflets, which agree with Pöeppig specimens. One sheet (M 12414) has vegetative material whereas the other sheet (M 12415) has mostly flowering material. Since Bentham examined these specimens and München is the main depository for the Martius collection, these two sheets probably represent the holotype for the name C. acuminata.

The name C. mucronulata disappeared from botanical literature after its original publication in 1839. Bentham did not include the name in synonymy in either his 1858 or 1862 treatments. Bentham cited one

collection as: "Ad Rio Madeira et Borba in Brasilia" with a prior notation that the type was in the Petersburg Herbarium (=LE). The type collection was not seen, but an Arnold Arboretum Herbarium specimen was examined which was collected by Riedel. It agreed in label data and was stamped "Herb. Acad. Petrop." This specimen was identified as C. mucronulata and is a probable isotype. It agreed with the type except for the slightly smaller flowers and smaller leaves. Although the flower size is 5.5-6 cm, the androecium and gynoecium agree with the size of the type, larger than any other species in this section. The leaves are narrow (2-4 cm), but are crowded towards the tip of the branches along with the inflorescences. It is believed that this specimen plus two others identified as C. mucronulata (Riedel 1336 and Spruce 1870) are C. amazonum collected in an immature state. Thus the name C. mucronulata is placed as a synonym of C. amazonum.

NOTES: This widespread species shows a great amount of variation in a number of structures. However, there appear to be two distinct forms based upon the minor variation in lateral leaflet shape. Intermediates have not been seen. Those specimens labeled C. mucronulata are distinct in size from these two forms, but are believed to be immature leaves of the form more commonly collected.

The name C. amazonum frequently is placed on specimens belonging to most other species in the section Bractearia. Clitoria amazonum can easily be distinguished from the other species by its large flowers and calyx, and its much narrower fruit. It appears to be an evolutionary shoot off the evolutionary line of C. arborea. Clitoria amazonum and C. arborea are the only two species which have the woody, paniculate inflorescences with conspicuous, elongated, primary branches. However,



in many characteristics, C. amazonum is more advanced than the previous species listed.

DISTRIBUTION (Figure 19): This species is found scattered in the riverine forests of the Amazon Basin in Brazil, generally on varzea land subjected to periodic flooding, infrequently on terra firma.

KEY TO FORMS:

1. Lateral leaflets suborbicular to short ovate, length/width ratio is less than 1.8 (2):1, apex broad, generally obtuse with short acumen, base rotund to weakly cordate . . . 6a. f. amazonum
1. Lateral leaflets elongated, ovate-elliptic to ovate-lanceolate, length/width ratio is greater than 2:1, apex gradually narrowed to acuminate tip, base broad cuneate to weakly rotund . . . . . 6b. f. vulgaris

6a. Clitoria amazonum f. amazonum

Clitoria amazonum Mart. ex Benth. f. rotundifolia Rizz.,

Arq. Jard. Bot. Rio de Jan. 17: 189. 1963.

Lateral leaflets short ovate to suborbicular, generally obtuse with a short acumen to 5 mm, base rotund to weakly cordate, length/width ratio is 1.1-1.8 (2):1.

NOTES: Rizzini described f. rotundifolia as "variat foliolis latiore ambitu, fere orbicularibus, 6-9 cm x 5-7 cm, basi leviter cordatis, apice acumine 1-4 mm longo praeditis" based upon one collection (Holotype: Ducke 8650, RB 11843!). Since the type of the species belongs to the typical form, Rizzini's name could not be adopted.

DISTRIBUTION: B R A Z I L. AMAZONAS: Environs de Manaus, 1906, Labroy s.n. (P); Rio Purus, Lago Prêto, 2 km north of Lábrea, 25 Jun 1971, Prance et al. 13690 (NY,S,U); Rio Ituxi, vic. Bôca do Curuquetê, 11 Jul 1971, Prance et al. 14138 (M,MICH,NY,U). Fortaleza, Rio Jurua, Nov 1901, Ule 5907 (G-2 sh.). PARÁ: Martius s.n. (W); Paran do Adanac, Faro, 7 Sep 1907, Ducke 8650 (RB). RONDNIA: Rio Ribero near confluence with Rio Madeira, 27 Jul 1968, Prance et al. 6579 (M,MICH,NY,S,US).

6b. Clitoria amazonum Mart. ex Benth. f. vulgaris Fantz, f. nov.

Clitoria acuminata Benth., Ann. Wein. Mus. Natur. 2: 115.

1837, non Graham (1828); nom. illeg.

Clitoria mucronulata Benth., Ann. Nat. Hist. 3: 345. 1839.

Lateral leaflets similar to terminal leaflets, smaller, ovate-elliptic to ovate-lanceolate, apex gradually narrowed to acumen (0.5) 1-2.5 cm, base broad cuneate to rotund, length/width ratio greater than 2:1.

TYPE COLLECTION: BRAZIL. Ad littora lacus Egensis, Septbr. 1831, Ega Amazon, Poeppig 2500 (HOLOTYPE: W. Isotypes: G-7, HAL 37532, NY).

This collection was selected as the type for the more common form because it is a syntype for the species C. amazonum, but was excluded from the typical form because of its elongated lateral leaflets. The Wein specimen has better material, including more matured leaflets, plus flowers and juvenile fruit. Complete data was found on only the New York specimen, a duplicate of Herbarium Vindobensis (W).

DISTRIBUTION: B R A Z I L. LOCALITY UNKNOWN: Martius s.n. (G).  
 AMAZONAS: 1924, Melin 204 (S); Rio Acari, Mar 1945, Cooper III s.n. (NY); Muratuba Feuchte campas, Aug 1927, Luetzelburg 21205 (M-2 sh.);  
 Ad flum. Amazonum ripas, Rio Negro, Martius s.n. (M-2 sh., type of synonym C. acuminata); Rio Negro Basin, between Ilha Jacaré and Airão, 11 Oct 1971, Prance et al. 15057 (M,NY,S,U); Rio Negro, inter Barra et Barcellos, Nov. 1851, Spruce 1870 (BM,CGE,G,NY,W-2 sh.); Fazenda Santo Antonio, Paraná do Xiborema, em frente de Manaus, May 1953, Fróes 29628 (NY); Manaus, Jun-Jul 1888, von Bayern s.n. (leafless, M); l.c., 30 Apr 1882, Schwacke 3871 (RB); Rio Japurá, Jubará, 15 Sep 1904, Ducke 6770 (BM,G); Rio Jurua Basin, Teffé, 11 Jun 1906, Ducke 7331 (RB); Paraguará, mun. Teffé, 22 May 1933, Krukoff 4529 (G-2 sh.,NY,S,U,US); Rio Solimões, Iauara, 18 Sep 1971, Prance & Prance 14751 (NY,U); Rio Ituxi-Purus, Igarape Caietitu, 2 km S of Lábrea, 1 Nov 1968, Prance, Ramos & Farias 8178 (NY); Rio Ituxi, vic Boca do Curuquetê, 8 Jul 1971, Prance et al. 13998 (NY,U); Rio Madeira, Borba, 23 Apr 1937, Ducke 479 (NY,US); Rio Madeira, ad Casaraesan, May 1828, Riedel 1336 (NY); Ad Rio Madeira et Borba, Riedel s.n. (A-isotype of synonym C. mucronulata).  
 RONDÔNIA: Basin Rio Madeira, 4 km above Jaciparaná on Rio Jaciparaná, 28 Jun 1968, Prance 5288 (NY,S,U); Basin Rio Madeira, Rio Pacaás Novas, 7 Aug 1968, Prance et al. 6854 (NY,S,US); Rio Guaporé, Vila France, 10 Jun 1952, Black & Cordeiro 52-14813 (leafless, NY); N bank of Rio Abunã, between Cachoeira Tres S and Fortaleza, 4-16 km above mouth, 18 Jul 1968, Prance et al. 6194 (GH,NY,S,U,US). PARÁ: Rio Tapajós, Boa Vista, May-Jun 1929, Dahlgren & Sella 68 (F,S); l.c., 1931, Costa 32 (F) Rio Tapajós, Cachoeira Maranhãozinho, 8 Dec 1915, Ducke 15870 (RB-2

sh.); Rio Xingú, 4 Jul 1909, Snethlage 10421 (G-2 sh.); Belém, hort. bot., Jun 1908, Huber 9352 (BM-2 sh., G-2 sh., RB, U, W).

7. Clitoria nervosa Herzog, Fedde Repert. Sp. Nov. Reg. Veg.

7: 56. 1909.

Tree, 6-18 m tall, to 20 cm diameter; bark grayish-brown (black teste Herzog) narrowly longitudinally striated, breaking off in square to rectangular pieces, brown beneath. Branches to 4 mm diameter, pith hollow, leaves tufted near apex, juvenile branches slightly compressed, angular, pubescence dense, yellowish-brown, spreading, becoming terete, short puberulent, white pubescence; bark dark brown, splitting longitudinally; axillary buds 2 mm, scales ovate, concave, pubescence minute, 0.1-0.2 mm; leaf scars suborbicular, bundle scars inconspicuous; stipule scar nearly straight to weakly falcate. Leaves 3-foliate, coriaceous, leaflets elliptic to ovate-elliptic, unequal, terminal leaflet largest, apex obtuse to abruptly short acuminate, acumen to 0.5 cm, sometimes splitting alongside midrib appearing emarginate, base rotund, midrib impressed above, primary nerves of 14-21 pair, upper surface dark green, glabrous, lower surface subvelutinous, densely pubescent, trichomes more dense along nerves, semiappressed, 5.5-15 cm long (25-28 cm teste Herzog), 3-8 cm wide. Petiole compressed-terete, base dark-colored, swollen 7-9 mm long, pilose, 3.5-3 cm; rachis similar to petiole, 1.5-3 cm. Petiolules subquadrangular to terete, reddish-brown densely velutinous, 7-10 mm. Stipules deciduous, narrow, deltoid-lanceolate, acute, sometimes weakly arcuate, sparsely pubescent, sometimes ciliolate, striations inconspicuous, 6-7 mm long, 2 mm wide;

stipels linear, gradually tapering to bluntly acute apex, 6-8 mm long, 1 mm wide at base. Inflorescence subpaniculate, axillary, 1-3 per axil with usually 1 long axis and 1-2 short axes, multiflowered, all axes densely pubescence, velutinous, reddish-brown, central axis 4-11 cm, usually from denuded nodes, primary branches which bear pedicels subsessile to 4 mm. Peduncle 10-13 mm, internodes axis 2-10 mm, shorter towards apex; pedicels 4-6 mm, reddish-brown velutinous. Bracts pubescence reddish-brown, dense, velutinous; bract base primary branch solitary, deciduous, ovate-lanceolate, 5-7 mm; middle bracts at base pedicel paired, concave, ovate, acute, semipersistent, somewhat reflexed in age, 5-7 mm long, 2 mm wide; inner and outer bracts caducous. Bracteoles large, coriaceous, narrow oblong-elliptic, subequalling calyx, obtuse, pubescence dense, short-velutinous, 11-14 mm long, 6-7 mm wide, inserted 1 mm below calyx. Flowers small size, 3-4 cm, white-lilac with rose-violet lines on inner vexillum. Calyx pubescence dense, short pilose, tube 9-12 mm long often splitting between dorsal and one of the lateral teeth, 3-4 mm wide at base to 4-6 mm wide at throat, lobes deltoid, acute, 3-4 mm long (appear to be 7-8 mm because of tube slit), ventral lobe 5 mm. Vexillum pubescence uncinata, covered by tawny, moderately dense, appressed trichomes, margins somewhat ciliolate. Alae with uncinata pubescent, extended beyond keel 4-5 mm, blade 17-22 mm long, 4-7 mm wide, claw 10-16 mm. Carina weakly falcate, uncinata-pubescent, 7-8 mm across, 4-5 mm wide, claw 18-20 mm. Staminal tube uncinata-pubescent at apex, 17-22 mm, free filaments uncinata - pubescent, 2-3 mm; anthers 2 mm long, 0.7-1.0 mm wide. Gynophore 4 mm; ovary pubescence dense, white, appressed, dark-colored beneath and more conspicuous towards margins, 11 mm long,

1.5 mm wide; style 14-15 mm long, geniculate 4-5 mm from distal end, beard of short trichomes, 0.6-0.9 mm long, stigma capitate, 0.5-0.8 mm diameter. Legume nearly linear, flat, coriaceous, glabrate with short hairs along both sutures, green, sutures thickened, stipitate, slightly exerted beyond calyx, 19-25 cm long, 2.1-2.3 cm wide, ventral margin undulate; stipe 12-21 mm, 3-4 mm thick to 6-9 mm wide at apex, beak 7-15 mm; dehiscence not observed. Seeds not seen, ca 6-8 seeds per pod. Figure 25.

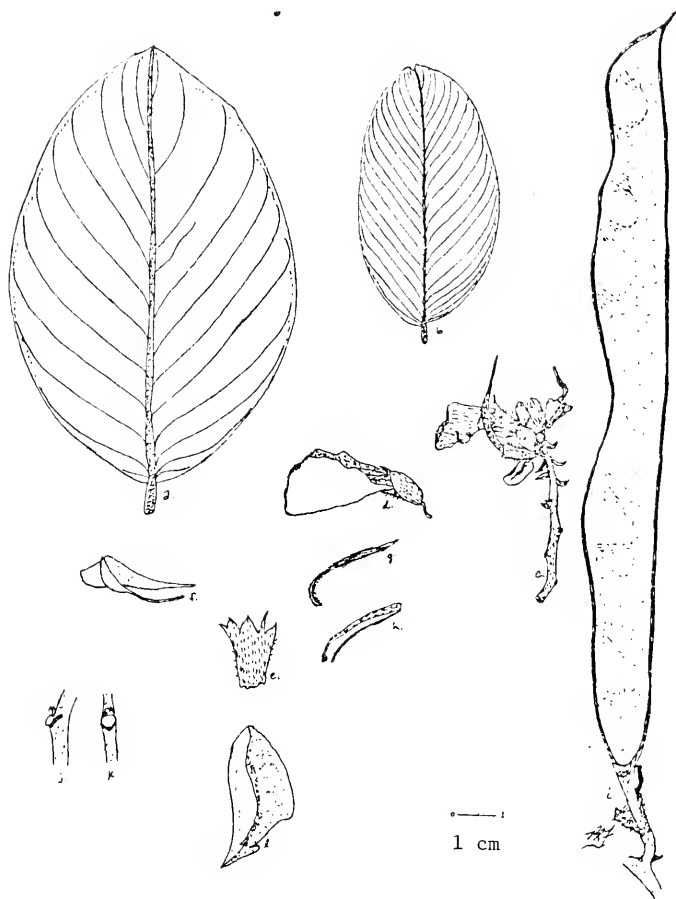
Herzog's Clitoria is characterized as a tree with subvelutinous leaves, small flowers, and with a pilose calyx hidden by the conspicuous, large, coriaceous bracteoles.

PHENOLOGY: Flowering specimens have been collected from September to December with the only matured fruits collected in mid-October.

TYPE COLLECTION: BOLIVIA. In den Savannenwaldchen der Hugel von Buenavista, 400 m, Oct 1907, Herzog 552 (Type believed to be at Berlin and destroyed; location of isotypes unknown). NEOTYPE: BOLIVIA. "Chancho," árbol hasta 18 m, sépalos verde-amarillos, pétalos blancos lilas con venas rosa-violáceas, sobre la parte céntrica del pistalo mayor andróceo, filamentos y pistilos blancos, estambres amarillos. Madera de un solo color amarillento, bastante resistente. Cascara sin grietas y casi sin fibra, Bosque del Rio Quimori, prov. Sara, Depto. Santa Cruz, 400 m, 20 Dec 1924, Steinbach 6781 (NEOTYPE: MO 929318. Isonotypes: A,BM,F 563846, G-275,K-446,S,UC 285029,W 25642).

A neotype collection was selected because the type at the Berlin Herbarium was destroyed by fire during World War II and the location of any isotypes, if they exist, is unknown. The Steinbach 6781 collection most nearly fits Herzog's original description except for its smaller

Figure 25. *Clitoria nervosa*. (a-b) leaflets, x 1; (c) inflorescence, x 1; (d) flower, x 1; (e) calyx, x 1; (f) ala and carina, x 1; (g) gynoecium, x 1; (h) androecium, x 1; (i) fruit, x 1; (j) stipular scar, x 1.5; (k) leaf scar, x 1.5; (l) vexillum, x 1. (Steinbach 6781, UC 285029: a,d-f,l; G-275: b-c; MO 929318: j-k. Prance et al. 1961, NY: i.)





leaves. The Missouri Botanical Garden specimen was chosen as the neotype because it had both attached leaves and inflorescences with flowers and juvenile fruits. Many of the other specimens have much of the material in packets. This collection also has a small sample of the wood.

Herzog does not indicate the calyx pubescence, but he does mention the tube size of 1 cm, which agrees with the specimens examined, and a lobe length of 7 mm, which is longer than the typical length. Although in apparent disagreement, the calyx tube often splits between the dorsal and lateral teeth, thus the tube apex is not always distinct, and a measurement of the lateral teeth will produce lengths of 7-8 mm. Other characters are in agreement, including the nerves, which are more tightly spaced in the smaller leaflets than in other closely related species. All Bolivian specimens examined with the large bracteoles that subequal the calyx, hiding it, belonged to this species. Even with the absence of a type for comparison, the Steinbach 6781 and other collections cited are C. nervosa.

VERNACULAR NAMES: BOLIVIA: Chancho, Steinbach 6781; Poroto (arbol), Steinbach 6399.

NOTES: Macbride (1943) reported C. nervosa from Peru. All the specimens that he cited belong to the species C. juninensis, which like other species closely related, can be distinguished from C. nervosa by their larger flowers and calyx pubescence of scattered appressed hairs.

DISTRIBUTION (Figure 19); The few collections of this species were obtained from forests in Santa Cruz, Bolivia, and from southeastern Acre, Brazil, at elevations reported as 400 m. B O L I V I A. SANTA CRUZ:

Bañado del Rio Guenda, prov. Sará, 400 m, 8 Sep 1924, Steinbach 6399  
(A,G). B R A Z I L. ACRE: 1-3 km road Sena Madureira to Rio Branco,  
10 Oct 1968, Prance et al. 7961 (NY,US).

Section Flexuosa

IB. Clitoria L. subgenus Bractearia (Mart. ex Benth.) Fantz

section Flexuosa Fantz, sect. nov.

Lianas, rarely erect shrubs or trees. Inflorescence weak to strongly zigzag towards apex, internode segments abruptly bent alternatively in opposite directions, subpaniculate, primary branches which bear pedicels inconspicuous, subsessile to 6 mm. Calyx pubescence dense, short, appressed, somewhat silky in appearance. Bracteoles coriaceous, broad, (6) 9-15 mm wide, subequalling the calyx or slightly shorter, or infrequently much shorter than calyx, 1-4 cm long. Flowers large, 6-8 (9.5) cm, white to lilac-rose. Staminal tube elongate, 3.5-5 cm; anthers large, 2-3 mm. Legume long-stipitate (2.5-4 cm), flat, coriaceous, pubescence appressed, typically 1.5-2.5 cm wide. Seeds brown, oblong, length greater than width, thickened.

The members of the section Flexuosa are characterized by their subpaniculate, zigzag inflorescences, large flowers, and somewhat silky calyx hidden usually by large, conspicuous bracteoles. Most members exhibit a climbing habit.

HOLOTYPE SPECIES: C. flexuosa Fantz

NOTES: This section is the more advanced section of the two whose members have primitive, large bracteoles which subequal the calyx and obscure it from view. In this section there is a trend towards shortening of the bracteoles, slightly so in a variety of C. flexuosa and most notably in C. pozuzoensis. However, the bracteoles remain broad (6 mm or more wide) even with a decrease in length, and are wider than the bracteoles of sections Brachycalyx and Cauliflorae. A trend

also exists towards the climbing habit, with most members being woody vines, and toward large flowers. Large flowers are typically 6-8 cm, although in this section, flowers of C. pozuzoensis sometimes attain a size of 9.5 cm.

This section is unique in the production of zigzag inflorescences. The flexuous rachis may be weakly developed in some individuals, but it can usually be observed near the apex of the inflorescence. Strongly flexuous inflorescences suggest sympodial growth in which the lateral branches exhibited dominant growth over the main axis. This type of growth might better be called pseudosympodial since the Clitoria paniculate inflorescences have only one lateral branch and the pedicel origin would shift from the apex of lateral branches to the main axes.

Section Flexuosa probably has its evolutionary affinities with the ancestors of C. amazonum which also exhibits the larger calices, flower-size, and androecium, plus a tendency towards climbing. Although the seeds exhibit a different shape, the legume has decreased in width as in C. amazonum.

DISTRIBUTION (Figure 9): The members of section Flexuosa are reported from Peru and Ecuador occurring in forests at elevations of 250-600 m. Infrequently collected, most members are known from one to a few collections.

#### KEY TO THE SPECIES:

1. Trees; inflorescence short, 1-2.5 cm; bracts medium-sized, 7-10 mm long, 4-7 mm wide; petiolules elongate, 8-11 mm; leaves obovate-elliptic or elliptic, length/width ratio less than 2:1; petiole of larger leaves 10-13 cm . . . . .8. C. woytkowskii

1. Lianas, rarely erect shrubs; inflorescence elongate, 2-10 (20) cm; bracts small, 3-6 mm long x 2-4 mm, or large, 8-15 mm long x 6-9 mm; petiolules shorter, 5-9 mm; leaves elongate, elliptic-lanceolate, oblong-lanceolate, to ovate-lanceolate, length/width ratio greater than 2:1; petioles of larger leaves 6-10 cm.
2. Bracteoles large, subequal to calyx to slightly shorter (half calyx length), 18-41 mm long, (8) 10-17 mm wide; bracts large, 8-15 mm long, 6-9 mm wide; alae claw short, 23-26 mm; carina claw short, 33-38 mm; legume long-stipitate, stipe 38-40 mm; staminal tube short, 39-45 mm; leaves subpilose below  
 . . . . . 9. C. flexuosa
2. Bracteoles small, much shorter than calyx (one-quarter to one-third of the calyx length) (6) 8-13 (15) mm long, 6-10 mm wide; bracts small, 3-6 mm long, 2-4 mm wide; alae long clawed, 26-33 mm, carina long-clawed, 39-42 mm; legume short-stipitate, stipe 25-34 mm; staminal tube long, 43-51 mm; leaves inconspicuously pubescent below, short, appressed  
 . . . . . 10. C. pozuzoensis

8. Clitoria woytkowskii Fantz, sp. nov.

Tree, 12 m tall. Branches 6-7 mm thick, pith hollow, pubescence strigulose, trichomes 0.1-0.4 mm; bark dark brown, splitting in longitudinal slits, light tan beneath; axillary buds 3 mm, scales ovate, concave, glabrate, striate with impressed nerves, leaf scar transversely oblong, rounded on lateral margins, bundle scars conspicuous, broad horseshoe-shaped, absent below, stipule scar horseshoe-shaped on nodose nodes, 4 mm long. Leaves 3-foliate, coriaceous, concolorless,

leaflets broad, elliptic to obovate-elliptic, apex broadly obtuse, abruptly acuminate, acumen 1-2 (2.5) cm long, 2-3 mm wide with expanded base of 6-10 mm wide, acumen apex mucronate, base broad cuneate, midrib weakly raised above with shallow groove on each side, primary nerves of 8-11 pair, upper surface glabrous, lower surface conspicuously strigose along nerves, (6) 10-18 cm long, 5-10 cm wide. Petiole quadrangular-terete, strigose, with one to three shallow longitudinal grooves, swollen base 7-11 mm, (5) 9-13 cm long, rachis (1.5) 2.5-3 cm. Petiolules slightly darkened, sparsely pubescent, 8-11 mm. Stipules deciduous, deltoid, broadly acute, sparsely pubescent, 4-5 mm long, 1-2 mm wide, stipels narrowly deltoid, tapering from base to apex, acute, 3-4 mm long, 0.6-0.9 mm wide, terminal stipels not observed, caducous (?). Inflorescence subpaniculate, axillary, crowded terminally, several-flowered, pubescence of juvenile axes silky, densely strigose, becoming sparsely strigose to glabrate, peduncle 3-5 mm, central axis 1-2.5 cm long, 2-3 mm thick, nodose, primary branches that bear pedicels subsessile, 1-3 mm; rachis internodes 1-2 mm, weakly zigzag. Pedicels not observed. Bracts conspicuously broad, reflexed in age, multi-nerved, moderately densely strigulose, somewhat silky, ciliolate, ovate, acute; middle pair 7-10 mm long, 4-7 mm wide, persistent; outer bract 4-6 mm long, 4-5 mm wide, semi-persistent; inner bract narrowly triangular, acute, deciduous, 7-8 mm long, to 1 mm wide. Bracteoles very large, coriaceous, broad and elongate-oblong, apex rapidly tapering, acute, pubescence somewhat silky, densely strigulose, 41 mm long, 13 mm wide. Flowers white, flushed with red veins (teste Woytkowski), banner darkened, grayish in dried state, mature flower not seen (Immature vexillum 5.5 cm,

protruding slightly beyond calyx. Comparison with other species of equivalent state indicates mature flower probably 7-8 cm). Calyx pubescence somewhat silky, densely strigulose, multi-nerved, tube 26 mm long, 9 mm wide at base, becoming slightly narrowed towards middle (7 mm) and expanding to 10 mm at throat, lobes ovate, short acuminate, 6 mm long, 4 mm wide, ventral lobe 8 mm x 1.5 mm, long-deltoid. Vexillum pubescence densely strigulose, silky, claw broad, cuneate, 7 mm. Alae extended beyond carina ca 5 mm, blade 22 mm long, 6-11 mm wide, subfalcate, broadly expanded beyond carina, uncinately pubescent, claw 14 mm. Carina falcate, acute, uncinately pubescent, blade 16 mm long, 5-6 mm wide, claw 22 mm. Disc exerted ca 5 mm above calyx base. Stamens diadelphous, free stamen coherent to near the middle; tube split near base into two groups, 35 mm long, free filaments 2-5 mm; anthers 3 mm long, 1 mm wide, connective apiculate. Gynophore 11 mm, dark-colored, nearly glabrate near base, rapidly sericeous toward apex; ovary densely sericeous, trichomes white with yellowish tinge, 17 mm long, 1.8 mm wide; style conspicuously dilated near point of geniculation, similar to a "cobra hood," nearly 1.5 mm wide, 18 mm long, geniculate 8 mm; stigma terminal, capitate, 1 mm diameter. Legume unknown.

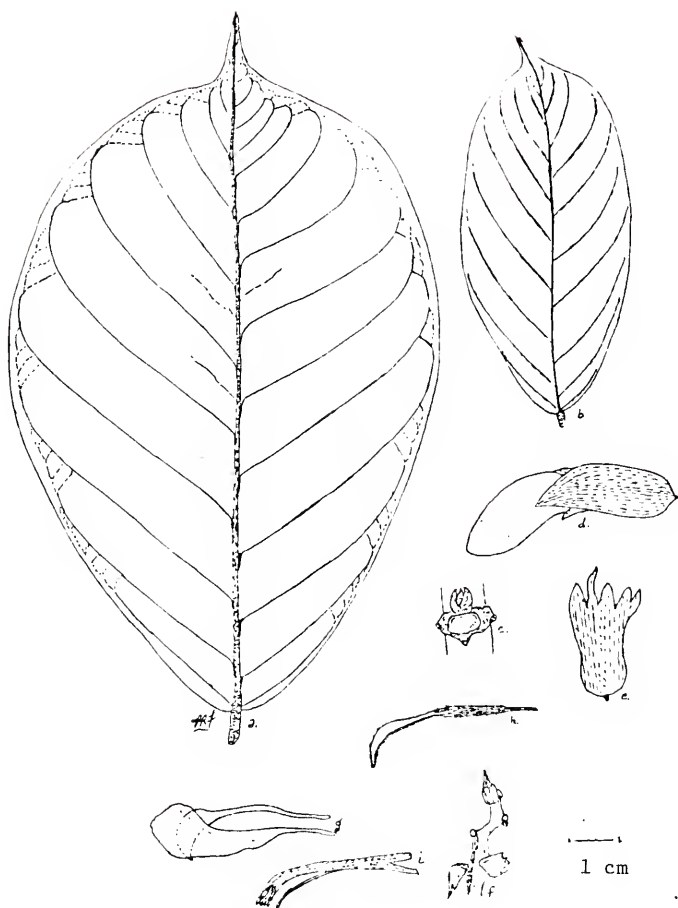
Figure 26.

Woytkowski's Clitoria is characterized as a tree with short, densely broad-bracteate inflorescences with zigzag internodes, and large flowers with silky calices and exceptionally large bracteoles subequalling the calyx.

PHENOLOGY: The only collection was made in the immature flowering state in mid-April.

Figure 26. Clitoria woytkowskii. (a-b) leaflets, x 1; (c) leaf scar and bud, x 3; (d) flower bud with bracteoles, x 1; (e) calyx, x 1; (f) inflorescence, x 1; (g) ala and carina, x 1; (h) gynoeceium, x 1. (Woytkowski 7231, GH: a,d-e, g-i; US 2575475: b-c,f.)





TYPE COLLECTION: PERU. Tree 12 m high, flowers white, rose flushed with red veins, in the forest, alt. 500 m, Saposoa, dept. San Martin, 12 Apr 1962, Woytkowski 7281 (HOLOTYPE: GH. Isotype: US 2575475).

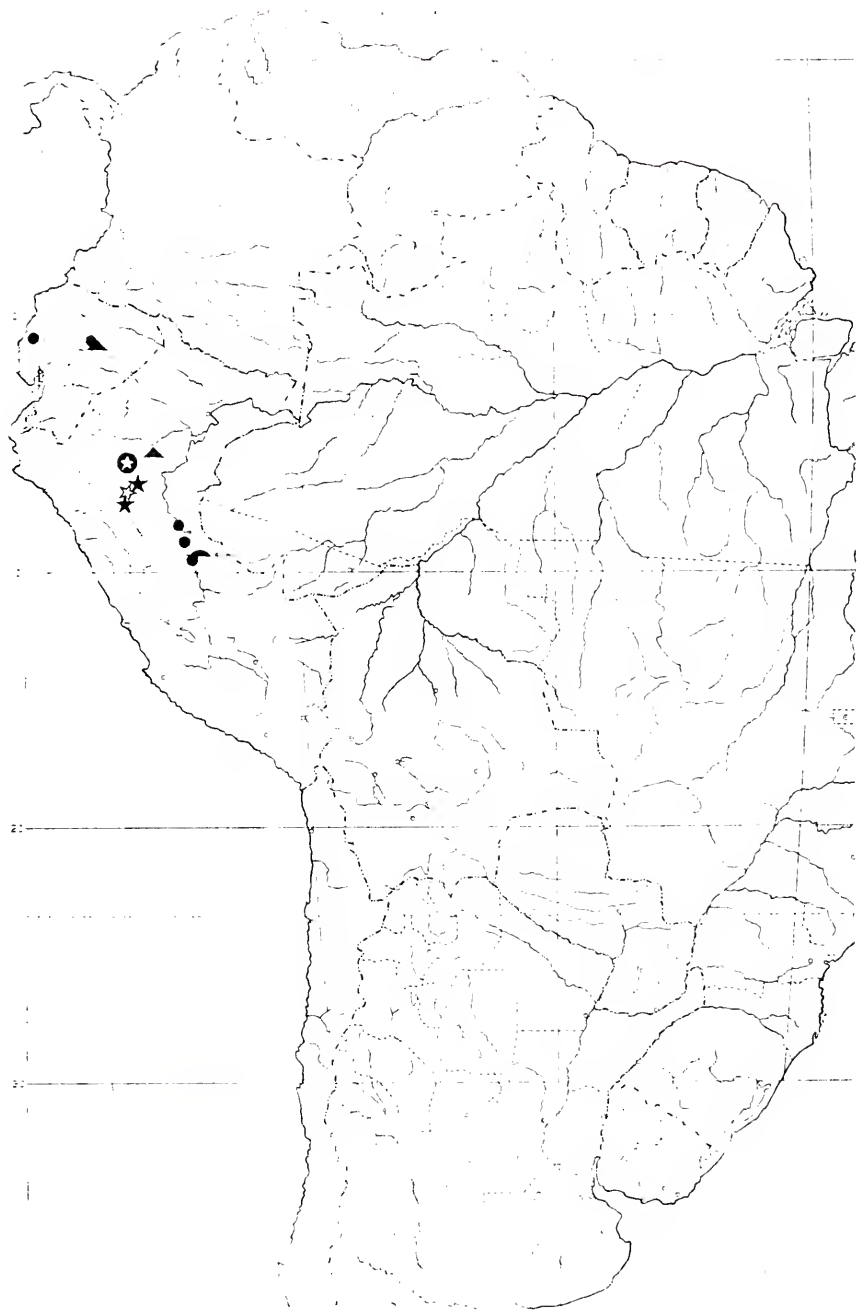
The Gray Herbarium specimen was selected as the holotype because it has both a flower, which was dissected, and mature leaves. However, no inflorescence was present. The Smithsonian specimen has smaller leaves plus a few short inflorescences, but no flowers. Thus both specimens were deficient in some of the taxonomically critical structures. The short inflorescences and conspicuous bracts suggested segregation from the liana species, but the floral structures provided more evidence since the comparison of it with other species showed differences.

NOTES: In the description of the floral structures of C. woytkowskii, some structures do not represent the mature state. Comparison with flowers of similar stages in the other two species (C. flexuosa and C. pozuzoensis) of section Flexuosa, indicate that the calyx, the bracteoles, the androecium, and the gynoecium represent matured structures. The anthers examined were well-developed. Thus, these measurements should be somewhat reliable. The petal sizes, especially the alae and vexillum, are smaller than those of the mature flower, thus, these measurements are unreliable.

This species has close affinities with C. flexuosa from which it is easily segregated by its arboreal habit, shorter inflorescences, larger bracts and petioles, and slightly larger bracteoles, and by its broader leaflets obovate in shape, and with inconspicuous pubescence below.

DISTRIBUTION (Figure 27): This species is known only from the type collection in forests near Saposoa, San Martin, Peru, at an altitude of 500 m.

Figure 27. South American distribution of three species of section Flexuosa. *Clitoria flexuosa* var. *flexuosa* (★), var. *brevibracteola* (✱); *C. pozuzoensis* var. *pozuzoensis* f. *pozuzoensis* (●), var. *pozuzoensis* f. *subpalmata* (▲), var. *schunkei* (◐); *C. woytkowskii* (☆).



9. Clitoria flexuosa Fantz, sp. nov.

Liana, to 30 ft long (teste Belshaw 3328). Branches to 5 mm diameter, pith hollow, pubescence puberulent and uncinat, denser on juvenile branches, subterete, weakly longitudinally striated, internodes 307 cm; bark dark brown; axillary buds 6-7 mm, scales ovate, acute, with minutely appressed pubescence. Leaves 3-foliolate, coriaceous, leaflets elongate, elliptic-lanceolate to oblong-lanceolate, occasionally ovate-lanceolate or oblanceolate, nearly concolorous, apex acuminate, acumens 2-2.5 cm, more or less mucronate, base rotund, midrib deeply impressed above, seemingly in a groove, often with short, suberect hairs, primary nerves of 8-11 pairs, upper surface glabrous or with suberect hairs on major nerves, lower surface subpilose with spreading hairs on veins, or hairs stiff, appressed, becoming sparse to subglabrate, 8-22 (27) cm long, 3-9 (12) cm wide. Petioles subquadrangular-terete, base darkened, swollen 6-8 mm long, pubescence moderate to dense, spreading, 4-10 cm; rachis 1-2 (5) cm. Petiolules subquadrangular, dark-colored, uncinat pubescence with overlying spreading trichomes, 6-8 mm. Stipules deltoid-lanceolate, acute, pubescence short, subappressed, moderately dense, 4-7 mm long, 2-3 mm wide; stipels linear, pubescence short, stiff, appressed, 3-6 mm long, 0.2-0.7 mm wide. Inflorescence axillary and terminal, subpaniculate, solitary, multiflowered, pubescence on all axes dense, appressed, reddish-tinged, central axis 2-10 cm, internodes conspicuously zigzag, bent alternatively in opposite directions, 4-9 mm long, primary branches which bear pedicels subsessile to 3 mm. Pedicels 4-9 mm. Bracts conspicuous, middle pair large, ovate, more or less apiculate, concave, (6) 8-15 mm long, 6-9 mm wide, reflexed in age; inner bract caducous;

outer bract deciduous, 6-7 mm long, 4-5 mm wide; bract at base primary branch deciduous, 4-8 mm long, 2-5 mm wide, ovate-lanceolate. Bracteoles very large, conspicuous, broad-oblong, obtuse to apiculate, pubescence minute, appressed, subequalling to somewhat longer than calyx, occasionally shorter to nearly half the calyx length, (17-25 mm in short bracteole variety) 23-41 mm long, 9-15 mm wide. Flowers large, 6-8 cm, white to lilac-rose, veins of vexillum pink to dark red. Calyx pubescence silky, dense, appressed, tube 21-29 (32) mm long, 4-6 mm wide at base to 8-11 mm wide at throat, lobes deltoid-ovate, nearly glabrous toward margins and apex, acute, 4-6 mm long, 3-4 mm wide, ventral lobe 6-7 mm. Vexillum pubescence silky, dense appressed, argenteous in bud becoming reddish-brown, 4-5 cm wide, claw 12-16 mm. Alae extended beyond keel 7-8 mm, blade 23-30 mm long, 5-12 mm wide, broadened beyond keel, claw 21-26 mm. Carina falcate, 13-19 mm across, 4-7 mm wide, claw 33-38 mm. Stamens diadelphous, vexillary stamen free, tube glabrous, split near base into two groups, 39-45 mm, free filaments 2-6 mm; anthers large, 2.5-3 mm long, 0.7-0.9 mm wide. Gynophore elongate, 7-10 mm; ovary pubescence white slightly yellowish tinged, very dense, appressed, 17-18 mm long, 1.5-1.8 mm wide; style 18-26 mm long, geniculate last 7-9 mm; stigma subcapitate, 0.8 mm diameter. Legume flat, coriaceous, long-stipitate, extending beyond calyx, pubescence appressed, ca 16-17 cm long, 14-19 mm wide; stipe 33-39 mm long; beak not observed; dehiscence not observed. Seeds brown, suborbicular, slightly longer than wide, thickened to 4 mm, surface smooth, bearing multiple ridges, ca 12 mm long, ca 10 mm wide, 6-7 seeds per pod; hilum oblong, 2 mm x 1 mm. Figures 28 and 29.

Figure 28. *Clitoria flexuosa* - I. Var. *flexuosa*: (a-b) leaflets, x 1; (c) inflorescence, x 1; (d) flower, x 1; (e) calyx, x 1; (f) bracteole, x 1; (g) androecium, x 1; (h) gynoecium, x 1. (Spruce 4527, K-441:a,d. Klug 3820, GH: b-c; BM: e-h).

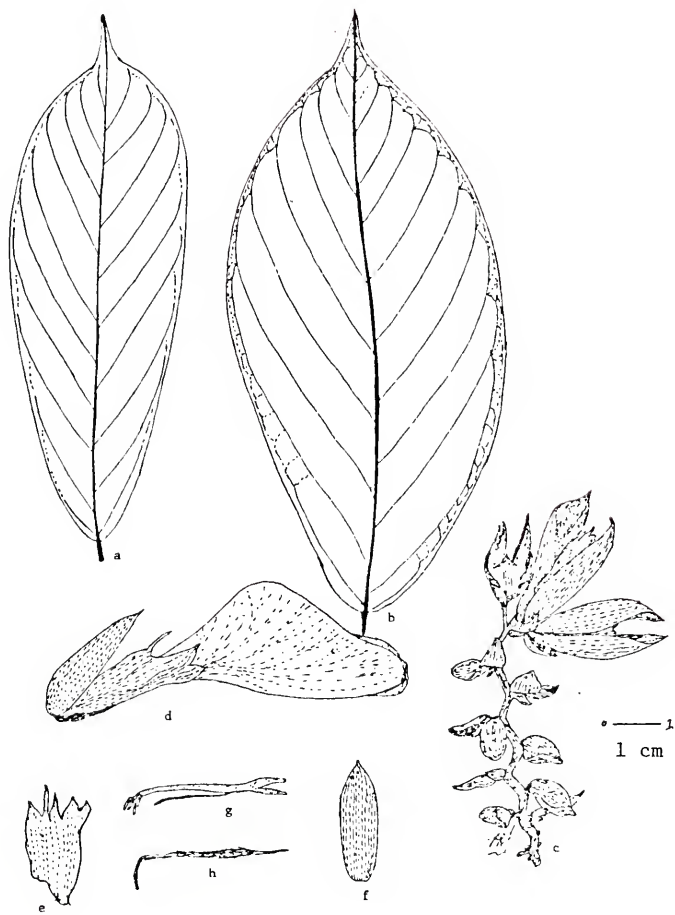
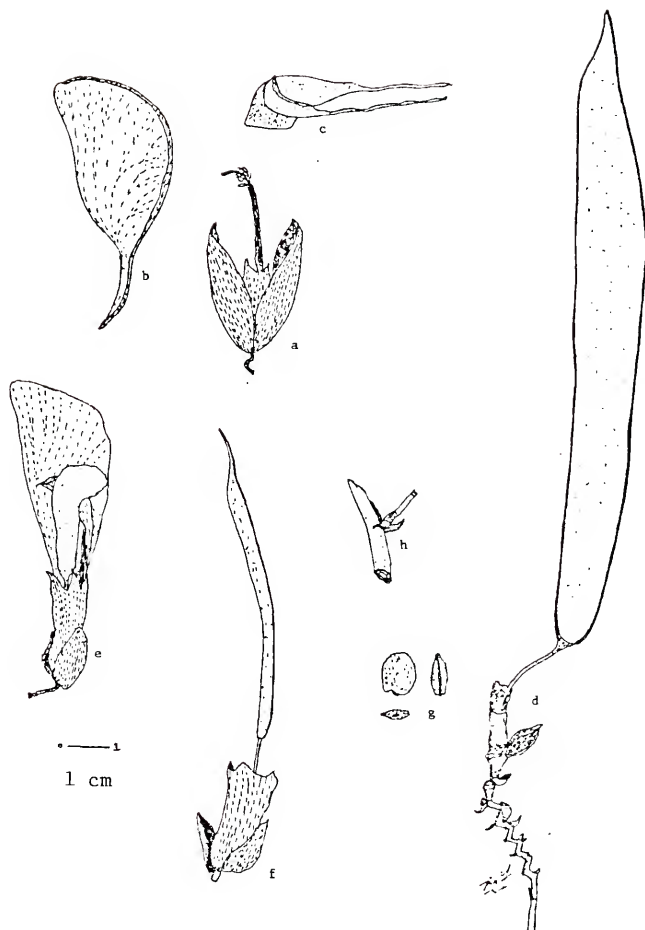




Figure 29. Clitoria flexuosa - II. Var. flexuosa: (a) calyx with bracteoles and staminal tube, x 1; (b) vexillum, x 1; (c) alae and carina, x 1; (d) inflorescence with persistent calyx and fruit, x 1. Var. brevibracteola: (e) flower, x 1; (f) calyx with immature fruit, x 1; (g) three views of seed, x 1; (h) node, x 1. (Klug 3820, F 70634: a-c. Spruce 4527, K-441: d. Klug 3105, HO 1056939: e-f, h; G-191: g).



The Flexuose Clitoria is characterized as a woody vine with inflorescences conspicuously zigzag, large-bracteated, and bearing large flowers with conspicuous bracteoles slightly shorter to longer than the calyx, or bearing long-stipitate fruits.

PHENOLOGY: The typical variety flowers from August to early March with var. brevibracteola flowering and bearing fruits in June. Fruits are rarely collected for the typical variety, the only collection having been made in February.

TYPE COLLECTION: PERU. Frutex volubili robustus, flores rosei, Tarapoto, secus r. illos [sic], Febr. 1856, Spruce 4527 (HOLOTYPE: K-441, Herb. Bentham. Isotypes: K-442, Herb. Hooker, W 18669).

Spruce 4527 was chosen as the type because, in addition to the flowers and zigzag inflorescence typical of most specimens, Spruce also collected fruit. The specimen of the Kew collection (Herb. Bentham) has the only fruit and was selected as the holotype. The leaves tend to be narrower than in other collections, but the flowers are typical. The Kew specimen (Herb. Hooker) has a typical, conspicuously zigzag inflorescence for which the specimen was named.

Klug 3820 has the typical larger leaves, zigzag inflorescences with many flowers, and a dissected flower (Gray Herbarium). Thus it was chosen as a paratype. Spruce s.n. from the type locality, lacking other data, was chosen as a second paratype.

VERNACULAR NAMES: PERU. Raca-sisa (i.e. flos clitoridis), Spruce s.n. (K-443).

NOTES: This species has very close affinities with the liana C. pozuzoensis from which it can be easily distinguished by the longer bracteoles and bracts, long-stipitate fruits, shorter staminal tube,

short-clawed petals, and foveolate, suborbicular seeds. Calices are slightly longer than those of C. pozuzoensis and leaf pubescence is typically pilose.

Several of these collections were cited by Macbride (1943) under the name C. amazonum, a species which is easily distinguished by its elongate primary branches in the inflorescence and lack of zigzag internodes of the main axis, plus the general glabrate appearance.

Woytowski 35227 is a mixed collection with some sheets bearing vegetative shoots with evenly-pinnate (4-foliate) leaves, with a gland present on the leaf-stalk between the petiolules (a Cassia). The Clitoria flowering shoots of this collection may lack leaves and be mounted with the non-Clitoria vegetative shoots.

DISTRIBUTION (Figure 27): This species is an endemic in forests near Tarapoto (San Martín) and Balsapuerto (Loreto), Peru, at elevations of 300-400 m.

#### KEY TO VARIETIES:

1. Bracteoles from slightly shorter, to subequal, or up to 1.25 x calyx length, width commonly 10-17 mm, length 23-40 mm; leaflets short-pilose below, becoming glabrate, trichomes spreading on nerves (San Martín) . . . . . 9a. var. flexuosa
1. Bracteoles shorter than calyx, 0.5-0.75 calyx tube length, width 8-10 mm, length 17-25 mm; leaflets pubescence below, Trichomes minute to short, appressed (Loreto) . . . 9b. var. brevibracteola

#### 9a. Clitoria flexuosa var. flexuosa

Leaves pilose below, becoming glabrate, trichomes on major nerves ascending, spreading. Bracteoles elongate, subequal to longer than

calyx, occasionally slightly shorter (0.8 x calyx), 23-40 mm long, 10-17 mm wide. Flowering commonly from August-March.

DISTRIBUTION (Figure 27): The typical variety is an endemic near Tarapoto, Peru, at elevations of 300-900 m. P. E. R. U. SAN MARTÍN: Tarapoto, Spruce s.n. (Paratype: K-443); l.c., Mathews 1584 (CGE-2 sh., E,K); 4 mi E of Tarapoto, 9 Mar 1947, Woytowski 35227 (Mixed, F-2 sh., G-3 sh., MO, UC-2 sh.); near Tarapoto on trail to Juan Guerra where it crosses Rio Hahuashiyacu, ca 1000 ft, 25-27 Aug 1937, Belshaw 3328 (F, GH, MO, NY, UC, US); Juan Juli, Alto Río Huallaga, ca 400 m, Dec 1935, Klug 4199 (A, BM, F, MO, NY, S, U, UC); l.c., Sep 1934, Klug 3820 (Paratype: BH, F 766344, GH, MO 1105520 & 1105521, NY, S); Alto Río Huallaga, Tarapoto, 360-900 m, Williams 6, 38 (I).

2b. Clitoria flexuosa Fantz var. brevibracteola Fantz, var. nov.

Leaves minutely pubescent below (vidi 20x), appressed. Bracteoles shortened, one-half to three-quarters of calyx length, 17-25 mm long, 8-10 mm wide. Flowering period in June.

TYPE COLLECTION: PERU. Liana, fls. white, red-striped, forest clearing, Balsapuerto, Dept. Loreto, 220 m, Jun. 1933, Klug 3105 (HOLOTYPE: G-190 & 191, Herb. Delessert. Isotypes: A, BM, F 684787, GH, MO 1065939, NY, S).

This collection has the leaf pubescence of C. pozuzoensis and the larger bracteoles of C. flexuosa, although intermediate in size between C. flexuosa and C. pozuzoensis. It would appear to be a hybrid except that the fruits and the flower structures and bracts compare favorably with C. flexuosa, and not with C. pozuzoensis. The one seed differs from those of C. pozuzoensis by its suborbicular shape and the

numerous, minute depressions on the surface of the seed coat. There are no seeds in typical C. flexuosa specimens for comparison, but the fruits agree. Therefore, it seems that this collection belongs to the species C. flexuosa, with the differences in bracteole length, leaf pubescence, and flowering period indicating varietal status, and supported by apparent geographic separation.

The Geneva specimen, mounted on two sheets within a common cover folder, was selected as the holotype because it was the only specimen that had a mature seed and fruit, in addition to the vegetative and flowering structures. The first sheet has a branch, inflorescence (juvenile), and leaves. The second sheet has a fruit with leaf, two flowers, one seed, and a piece of a fruit in a packet.

DISTRIBUTION (Figure 27); This variety is known only from the type locality of Balsapuerto, Loreto, Peru.

10. Clitoria pozuzoensis Macbride, Pub. Field Mus. Nat. Hist.  
Bot. 8: 103. 1930.

Liana or rarely an erect shrub, climbing 6-9 m high. Branches to 5 mm thick, pith hollow, nearly terete, pubescence uncinata and short-appressed, soon glabrate, seldom branching, internodes typically 1.5-3.5 cm; axillary buds 2-3 mm, scale pubescence appressed; bark dark brown, splitting longitudinally in strips, lightened beneath. Leaves 3-foliate, chartaceous to thin-coriaceous, leaflets elliptic-lanceolate to ovate-lanceolate, occasionally oblanceolate, apex acuminate, acum 1-2.5 cm, base cuneate to rotund, midrib impressed above, primary nerves of 9-13 pair, upper surface brilliant green, glabrous, lower surface green, pubescence minute (vidi 20-30x), stiff, appressed, 7-16 (19) cm long, 3-9 cm wide. Petioles weak quadrangular

to terete, longitudinally striate-caniculate, scattered minute, appressed pubescence, 3-8 (11.5) cm; rachis slightly laterally compressed, 1.5-3.5 cm, rarely nearly lacking. Petiolules subquad-rangular, brown, pubescence rufous, appressed, 5-9 mm. Stipules deciduous, deltoid, pubescence uncinata and rufous, appressed, 3-6 mm long, 1-2 mm wide; stipels caducous, linear, 2-5 mm long, 0.5-1 mm wide. Inflorescence in upper part of branchlets, appearing before leaves, axillary and terminal, subpaniculate, solitary, multiflowered, pubescence on all axes dense, rufous, appressed, central axis 1.5-6 (20) cm, internodes short, weakly zigzag, primary branches which bear pedicels 2-6 mm. Pedicels 5-12 mm. Bracts with rufous, appressed pubescence, acute; middle bracts paired, ovate, persistent, 3-6 mm long, 2-4 mm wide; outer bract oval, 3-4 mm long, 2-3 mm wide. Bracteoles broad, coriaceous, conspicuously shorter than calyx, oblong to ovate to nearly orbicular, obtuse, pubescence rufous, appressed, (6) 8-13 (15) mm long, 6-10 mm wide. Flowers large, 6-8 (9.5) cm, white to pale lilac, vexillum streaked pink to red. Calyx pubescence silky, tawny, appressed, dense, tube 19-25 (27) mm long, 5-8 mm wide at base to 8-12 mm wide at throat, lobes broadly deltoid, nearly equal, 4-6 mm long, 4-5 mm wide, ventral lobe 2-3 mm wide. Vexillum 4-6 cm wide, pubescence dense, tawny, appressed, claw 13-15 mm. Alae extended beyond carina 7-9 mm, blade 27-33 mm long, 6-10 mm wide, claw 26-33 mm. Carina strongly falcate, blade 13-18 mm across, 6-7 mm wide, claw 39-42 mm. Stamens diadelphous, staminal tube glabrous, split at the base into two parts, 43-51 mm long, free filaments 2-6 mm; anthers large, 2-2.75 mm long, 0.5-0.8 mm wide. Gynophore 7-8 mm, with moderately dense, appressed pubescence near apex; ovary pubescence

white, dense, appressed, 15 mm long, 2 mm wide; style beard of dense, uncinate pubescence dorsally, 30-32 mm long, geniculate 9-10 mm from distal end, broadened below geniculate point, 1 mm wide; stigma subcapitate, 1 mm diameter, base pubescence of short trichomes.

Legume long-stipitate, exerted beyond calyx, green, flat, pubescence inconspicuous (vidi 20x), appressed, ca 14-16 cm long, 18-25 mm wide; stipe 25-34 mm; beak to 4 mm; dehiscence causing valves to twist one-half of a turn. Seeds brown, smooth, oblong, conspicuously longer than wide, slightly thickened 3-4 mm, ca 16 mm long, 10 mm wide.

Figures 30 and 31.

Macbride's Clitoria is characterized as a woody climber with large flowers bearing the large, primitive bracteoles, much shorter than the calyx.

PHENOLOGY: This species flowers from April to September. Fruiting specimens are rarely collected. Juvenile fruits were collected in July and a mature fruit was collected in September.

TYPE COLLECTION: PERU. Shrub, fls. purplish, Pozuzo, ca 3000 ft, 20-22 Jun 1923, Macbride 4652 (HOLOTYPE: F 535727. Isotype: G-292, Herb. Delessert. Cotype: G-291, Herb. Delessert, flower and bud only).

Only the specimen at the Field Museum bears the word "shrub" on the label, the habit description Macbride used in his original description of the species in 1930 and again in his treatment (1943) of the Peru flora. All other specimens matching the type bear the word "liana" or "woody vine." The type specimen is poor, with two leaflet fragments and a juvenile inflorescence with buds. One mature flower is present in a packet. A better representation of the species is obtained from other collections, such as Mexia 7242.



Figure 30. *Clitoria pozuzoensis* - I. Var. pozuzoensis f. pozuzoensis:  
(a-b) terminal leaflets, x 1; (c) inflorescence, x 1;  
(d) flower, x 1; (e) calyx and androecium, petals removed,  
x 1; (f) vexillum, x 1; (g) alae and carina, x 1;  
(h) gynoecium, x 1. (Mexia 7242, F 8619.7: c-h;  
UC 743483: a-b.)

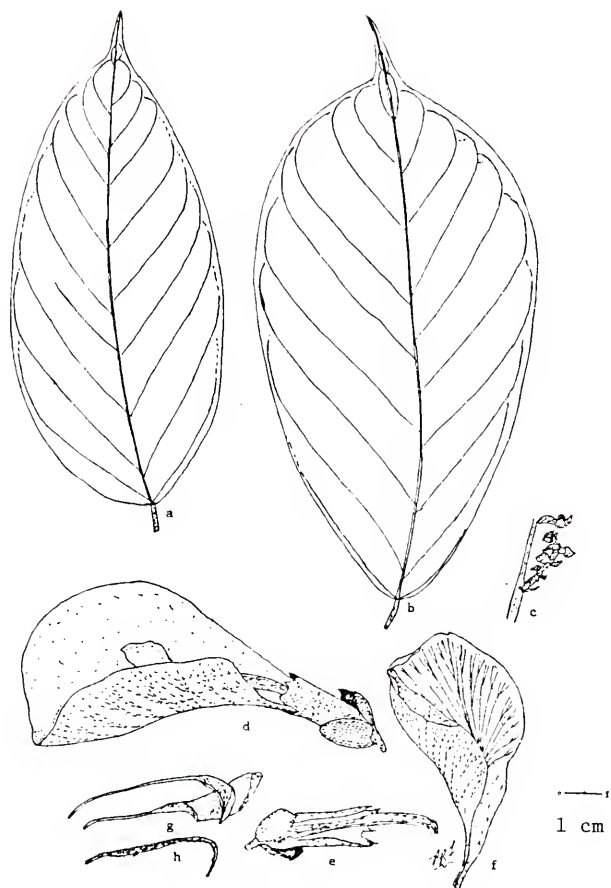
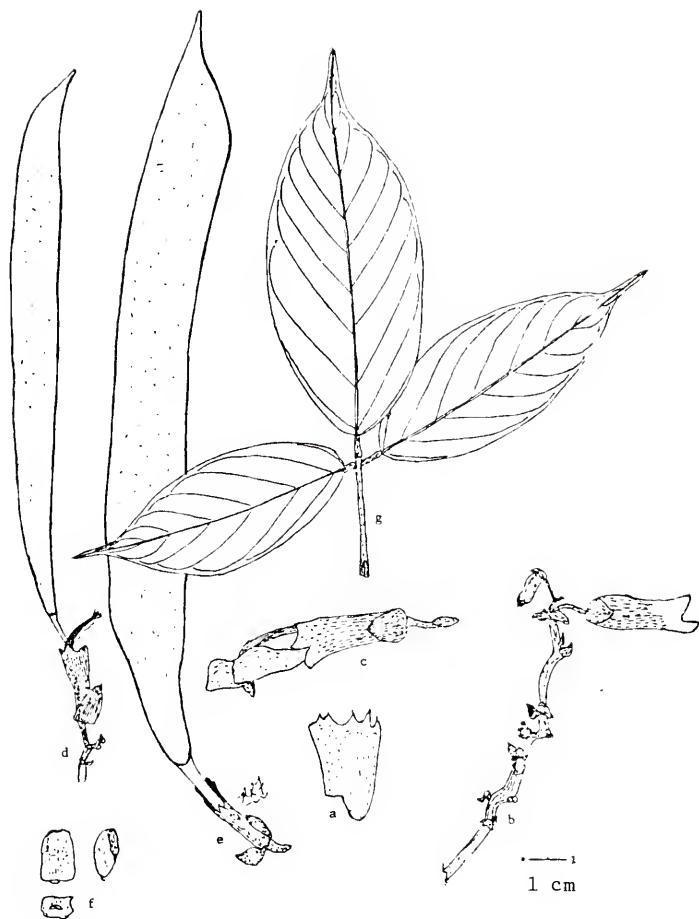


Figure 31. *Clitoria pozuzoensis*. Var. *pozuzoensis* f. *pozuzoensis*:  
(a) calyx, x 1; (d) juvenile fruit, x 1. Var. *pozuzoensis*  
f. *subpalmata*: (g) subpalmate leaf, x 1. Var. *schunkei*:  
(b) inflorescence, x 1; (c) flower, vexillum removed, x 1;  
(e) fruit, x 1; (f) three views of seed, x 1. (Mexico  
7242, F 861987: a. Taylor 3583, Mathias & Taylor 3583  
US 2639622: d. Grubb et al. 174: g. Schunke 2773,  
F 1688611: b-c,e-f.)



VERNACULAR NAMES: PERU: Soga de Machete, Mathias & Taylor 3583;  
Vaina huasca, Mathias & Taylor 3583.

ECONOMIC IMPORTANCE: This species may be used locally near Anaconda Island, Río Napo, Ecuador, as a medicinal remedy administered to couples to increase fertilization (see p. 15).

NOTES: This species has close affinities with C. flexuosa which is easily recognized by its bracteoles subequaling the calyx, large bracts, conspicuously zigzag inflorescences, and pilose leaflets. Macbride (1943) indicated that C. pozuzoensis "seems doubtfully distinct from C. grandifolia or C. javitensis." These two species are superficially similar in appearance but different in the cauliflorous inflorescences with non-zigzag internodes, minute bracteoles, subsessile ovaries, smaller anthers, densely pubescent fruit with smaller seeds, and sparse calyx pubescence.

The leaves are typically pinnately 3-foliate, with a long rachis. There is a tendency for the rachis to nearly disappear, giving the leaves a subpalmately compound appearance, a minor variation recognized as a form. A greater variation occurs in one collection with the more primitive erect growth and longer inflorescences and pedicels, and is treated as a variety.

DISTRIBUTION (Figure 27): This species is found in the riverine forests of Peru and Ecuador at elevations reported as 135-600 m.

KEY TO VARIETIES AND FORMS:

1. Inflorescence short, 1.5-6 cm; pedicels 5-7 mm; woody vine  
   . . . . . 10 a. var. pozuzoensis
2. Rachis present, 1.5-3.5 cm; petiole 3-6 (11.5 cm)  
   . . . . . 10aa. f. pozuzoensis

2. Rachis nearly absent, 0.1-0.4 cm; petiole shorter, 1-4 cm

. . . . . 10 ab. f. subpalmata

1. Inflorescence elongated, (5) 8-19 cm; pedicels 10-12 mm; shrub

with climbing apex . . . . . 10b. var. schunkei

10aa. Clitoria pozuzoensis var. pozuzoensis f. pozuzoensis

Woody vine. Inflorescence short, weakly flexuosus, 1.5-6 cm.  
Pedicels short, 5-7 mm. Leaves pinnately compound, long-stalked,  
petiole 3-8 (11.5) cm; rachis conspicuous, 1.5-3.5 cm.

DISTRIBUTION (Figure 27): P E R U. HUANUCO: Bosque Nacional de  
Imparia, a lo largo del Rio Pachitea cerca del campamento Miel de Abeja,  
1 km arriba del pueblo de Tournavista o unos 20 km arriba de la  
confluencia con el Rio Ucayali, Dtto. Honoria, Prov. Pachitea, 300-  
400 m, 26 Apr 1967, Schunke 1866 (G,NY,US). LORETO: Bosque Nacional  
de Iparia del Rio Ucayali, en la trocha a Tabacoa, al oeste de Iparia,  
80 km arriba confluencia con el Rio Pachitea, Dtto, Iparia, Prov.  
Coronel Portillo, 250-300 m, 22 Aug 1968, Schunke 2655 (F,US); west  
bank above Rio Aguaytia, 8-10 km below Aguaytia, 4 Jul 1959, Mathias &  
Taylor 3583 (US-2 sh.).

E C U A D O R. MANABI: Rocafuerte, Hacienda Arcadia, 200 m,  
22 Jul 1933, Heinrichs 511 (G,M,NY). ORIENTE: Canyon Napo, Rio Tena  
near Tena, 11 Apr 1935, Mexia 7242 (F,UC).

10ab. Clitoria pozuzoensis Macbride var. pozuzoensis f. subpalmata  
Fantz, forma nov.

Woody vine. Inflorescence short, weakly flexuosus, 1.5-6 cm.  
Pedicels short, 5-7 mm. Leaves seemingly palmately compound, terminal

leaflet stalk subsessile, petiole short, 1-4 cm; rachis nearly absent, inconspicuous, 0.1-0.4 cm.

TYPE COLLECTION: ECUADOR. Liane, fls. white, veins pink, disturbed ground, forest edge, Puerto Napo, 1500 ft, 14 Jul 1960, Grubb, Lloyd, Pennington, & Whitmore 174 (HOLOTYPE: K-451. Isotypes: NY).

This form is easily recognized by the 3-foliate, subpalmately compound leaves. The Kew specimen had a flowering inflorescence as well as the vegetative structures, thus it was selected as the holotype. The label indicated that a duplicate specimen was sent to the Quito Herbarium (Q). It was not seen by this author.

DISTRIBUTION (Figure 27): This form is known from two widely separated areas, the type locality in Ecuador and Loreto, Peru.

P E R U. LORETO: wooded banks of the lower Rio Huallaga, 135 m, 5-11 Sep 1929, Killip & Smith 29005 (Paratype: NY).

10b. Clitoria pozuzoensis Macbride var. schunkei Fantz, var. nov.

Climbing shrub. Inflorescence elongated, weakly flexuous towards apex, (5) 8-19 cm long. Pedicels elongated, 10-12 mm.

TYPE COLLECTION: PERU. Loreto: Arbusto trepador de 7-8 m, flores rosadas, fructos inmaturos de color verdoso pardo; en el interior del estandarte con líneas longitudinales de color rojo violeta, sépalos verdes amarillentos; las láminas de las hojas son onduladas, en la cara superior brillosas de color verde amarillento, en la cara inferior con el nervio central de color amarillo; en bosque bajo, terreno de aluvión a 1 km abajo de Ipariá al noroeste del Río Ucayali, 250 m, 5 Sep 1968, Schunke 2773 (HOLOTYPE: F 1688611. Isotypes: G-187 & 188, NY).

This variety is easily distinguished from the typical variety by its shrubbier habit and elongated inflorescences. The Field Museum specimen was selected as the holotype because it had fruits, flowers, and inflorescences. This variety is known only from its type locality.



### Section Brachycalyx

1C. Clitoria L. subgenus Bractearia (Mart. ex Benth.) Fantz  
 section Brachycalyx Fantz, sect. nov.

Trees or tall erect shrub-treelets, rarely lianas. Leaves deciduous, typically about flowering time, upper surface pubescence minute hirsute, infrequently glabrous, lower surface conspicuously pubescent, infrequently inconspicuously pubescent to glabrous. Stipules deciduous to caducous, lanceolate, acute, narrow, 1-2 mm wide. Inflorescence nodose-racemose, axillary, usually appearing at denuded nodes. Calyx tube short, sometimes cup-shaped (campanulate-tubular), 7-15 mm long, lobes broadly deltoid, minute nearly lacking, width usually subequalling length to broader than long, 1-4 mm long, 3-4 mm wide. Bracteoles minute, 2-5 mm long, 1.5-3 mm wide. Legume pubescent, weakly to strongly depressed between the seeds at maturity. Seeds suborbicular to slightly longer than wide, compressed, typically 7-13 mm diameter, 2-3 mm thick.

The members of the section Brachycalyx are easily recognized by their short tubular to cup-shaped calices with minute lobes, inflorescences appearing from denuded nodes, submentaceous fruits, and usually erect habit. With the exception of C. glaberrima and C. canescens, the members are also easily distinguished by the minute hirsute pubescence on the upper leaf surface, which has the texture of sandpaper as one moves his hands over the surface from leaf apex to its base. Clitoria selloi has a short calyx but large calyx lobes and longer bracteoles. Some individuals of C. javitensis have short lobes of 4-5 mm, but

elongated tubes with other individuals having longer lobes. Both species are lianas which bear cauliflorous inflorescences and other structures which agree more with section Cauliflorae. Fruits have not been seen in C. selloi, but those of C. javitensis bear seeds similar in shape and thickness to section Cauliflorae. These two species, C. selloi and C. javitensis, which bear some superficial resemblance to section Brachycalyx, are more naturally affiliated with members of section Cauliflorae.

HOLOTYPE SPECIES: C. brachycalyx Harms.

NOTES: This section has closer affinities to section Cauliflorae than to the other two sections within subgenus Bractearia. Both these sections lack the large, coriaceous, primitive bracteoles that subequal and obscure the calyx. They also possess the racemose, nodose inflorescences which lack the primary lateral branches. The pedicels are borne directly from a conspicuous lignose node on the central axis. In addition, the inflorescence often appears separate from the leaves, developing from denuded nodes before the appearance of leaves in section Brachycalyx and being cauliflorous and developing below the leaves in section Cauliflorae. The members of section Cauliflorae can be distinguished from section Brachycalyx by their longer calices with prominent lobes, by their legumes which are not conspicuously depressed between the seeds, by the thicker seeds, and usually by the liana habit and glabrous upper surface of the leaves.

DISTRIBUTION (Figure 10): The members of section Brachycalyx are found in dry tropical forest or sometimes in open grassy areas or savannas, usually at lower altitudes to 900 m in elevation, in northwestern South America and adjacent Panama. Members have been

collected from western Guyana to Ecuador, and Panama, with isolated collections of C. glaberrima recorded in a few countries of Central America north to Chipas, Mexico.

KEY TO THE SPECIES:

1. Flowers medium-sized, 4-5.5 (6) cm; ovary elongate, 14-18 mm; legume narrow, 1-1.5 cm wide; stipules minute (caducous), 3-4 mm; vexillum claw long, 8-10 mm; carina claw long, 20-27 mm. ala extended well beyond carina, 6-10 mm.
2. Inflorescence elongate, (3) 5-15 (22) cm; leaflets acuminate (acumen 0.5-1 cm), upper surface glabrous (juvenile leaflets pubescent along midrib); staminal tube long, 27-33 mm; anthers 1.5-2 mm; flowering period August to October (SW Ecuador) . . . . . 11. C. brachystegia
2. Inflorescence short, to 2 cm long; leaflets obtuse or abruptly short-acuminate (acumen to 0.5 cm), upper surface pubescence minute, subappressed to hirsute; staminal tube short, 24-26 mm; anthers 2-2.5 mm; flowering period January (SE Colombia) . . . . . 12. C. hermannii
1. Flowers small, 2.5-4 cm; ovary short, 10-13 mm; legume broad, 1.6-2.6 (3) cm wide; stipules conspicuous (caducous), 4-7 (10) mm; vexillum claw short, 4-6 (8) mm; carina claw short, 12-20 mm; alae shortly extended beyond carina, 4-7 mm.
3. Leaves glabrous on both surfaces; calyx pubescence microscopic, uncinata; inflorescence very short, to 1 cm long; bracts large, 3-5 mm; stipe short, 10-14 mm; vexillum claw 7-8 mm; anthers 1-1.5 mm (Central America, northern Venezuela). . . . . 13. C. glaberrima

3. Leaves conspicuously pubescent below, minutely pubescent above (except in C. canescens); calyx pubescence macroscopic, moderately dense, short-appressed; inflorescence 1-7 cm; bracts minute, 1-3 mm, stipe elongate, 24-45 mm, vexillum claw 4-6 (7) mm; anthers 1.5-3 mm.
4. Leaves glabrous above, with appressed pubescence below; calyx tube 14-15 mm long; staminal tube glabrous; style 18 mm; flowers appearing in late march (S. Venezuela) . . . . . 14. C. canescens
4. Leaves minutely pubescent above, velutinous or pilose pubescent below; calyx tube 7-13 mm; staminal tube more or less uncinately pubescent towards apex; style 10-16 mm; flowers appearing in October to February.
5. Trees or tall shrubs; leaf pubescence below moderate to densely velutinous, petiolules 7-10 mm; calyx tube shorter, 7-11 cm long; anthers small, 1.5-2 mm; ala claw 10-17 mm; leaflet apex obtuse or abruptly acuminate, acumen to 0.5 cm.
6. Calyx cup-shaped, broad at throat, 8-12 mm wide; flowers white; staminal tube 23-31 mm; pedicels 5-8 mm; carina 10-14 mm x 3-5 mm; bracts minute, 1-2 mm; stipules 4-6 mm; inflorescence longer, 2-7 cm (W. Guyana and adjacent Brazil) . . . . . 15. C. brachycalyx
6. Calyx narrowly tubular, throat 5-7 mm wide; flowers purple; staminal tube 16-22 mm; pedicels 3-6 mm; carina 7-9 mm x 2-3.5 mm; stipules 6-8 mm;

inflorescence shorter, 1-3 (5) cm (Venezuela and  
Colombia). . . . . 16. C. dendrina

5. Liana; leaf pubescence below pilose, more dense on  
nerves; petiolules 5-7 mm; calyx tube long, 12-13 mm;  
anthers elongate, 2.3-3 mm; ala claw 7-9 mm; leaflet  
apex obtuse to acuminate, acumen to 1.5 cm (W. Brazil).  
. . . . . 17. C. froesii

11. Clitoria brachystegia Benth., Bot. Voy. Sulph. 84. 1844.

Ternatea brachystegia (Benth.) Kuntze, Riv. Gen. Pl. 1: 210.  
1891.

Erect shrub to small tree, 2-8 m tall, with spreading branches,  
d.b.h. = 4 ft (Little 6685); bark light gray, smoothish, but with many  
cracks (Little 6685). Branches to 8 mm diameter, pith dark-colored,  
solid to occasionally hollow, juvenile branches blunt-angular,  
longitudinally striated, pubescence moderately dense, short, appressed,  
branches becoming subterete, non-striated, glabrous with age, axillary  
buds 3 mm. Leaves 3-foliate, subcoriaceous, deciduous, leaflets  
ovate-elliptic to elliptic to ovate, rarely obovate, apex acuminate,  
acumen obtuse, 0.5-1 cm long, base rotund to rarely weakly retuse,  
midrib impressed above, primary nerves 9-12 pair, upper surface glabrous  
(juvenile leaflets minutely hirsute, denser towards midrib), lower  
surface lighter green, usually pilose with 0.5-0.8 mm hairs, moderate  
to dense, occasionally nearly glabrate with trichomes confined mainly  
on larger nerves, lamina 7-15 cm long, 4.5-8 (11) cm wide. Petiole  
subterete, subpilose, 6-11 (19) cm; rachis 2-4 (6) cm. Petiolules dark,

subquadrangular, weakly rugose, moderately densely pilose, 4-6 mm. Stipules caducous, usually lacking on specimens, linear-lanceolate, acute, pubescence appressed, 3-4 mm long, 1 (1.5) mm wide; stipels caducous, linear, acute, (1) 2-3 mm long, 1 mm wide. Inflorescence usually appearing before leaves, at denuded nodes, axillary and terminal, multiflowered, racemose, nodose; axes blunt-angular, longitudinally striated, pubescence moderately dense, rufus, spreading to erect, with a few trichomes appressed, axes elongated, 3-15 (22) cm long, occasionally with small-sized, deciduous leaves appearing at the lower inflorescence nodes during late flowering stages. Pedicels 4-7 mm. Bracts small, deciduous, lanceolate-ovate, acute, pubescence appressed, dense, rufescent, ca 1 mm long trichomes, usually 2 (3) mm long, 1-1.5 mm wide. Bracteoles small, oval to ovate, acute deciduous, at first appressed to calyx, becoming spreading, pubescence appressed, rufus, dense, 2-3 mm long, 1.2-1.6 mm wide, inserted 1 (2) mm below calyx. Flowers basically white with creamy to rose to lilac to pale lavender tints occurring from the medial nerves of the inner face of the vexillum, medium-sized, 4-5.5 (6) cm long. Calyx short-tubular and narrow to cup-shaped, pubescence short, appressed, sparse to moderate with inconspicuous uncinat trichomes beneath, more conspicuous on the lobes, tube 9-13 mm long, 5-7 mm wide near base to 8-10 mm wide at throat, lobes minute to nearly lacking, broad deltoid, ciliolate, 1-2 mm long, 3-4 mm broad at base, ventral lobe acute to apiculate, generally 2 mm long, 2 mm wide at base. Vexillum densely sericeous outside, blade 3.5-4 cm wide, claw 8-10 mm. Alae well extended beyond carina, 6-10 mm, blade 17-24 mm long, 6-10 mm wide, claw 14-23 mm. Carina falcate, 9-13 mm long, 4-5 mm wide, claw 21-27 mm. Staminal

tube 27-33 mm, free filaments 2-4 mm, glabrous; anthers lanceolate, 1.5-2 mm long, 0.25-0.5 mm wide. Gynophore ca 5 mm; ovary 14-18 mm long, 1 mm wide, pubescence appressed, dense, white; style 15-18 mm, geniculate the 6-8 mm from the distal end; stigma dilated, 0.5-1 mm diameter, pubescence dense at base. Legume: stipitate, exerted well beyond the calyx, pubescence moderate to densely uncinat with scattered, short, suberect, macroscopic trichomes, valves flat, depressed between the seeds, coriaceous, 15-19 (24.5) cm long, 12-17 mm wide; stipe 24-29 mm; beak when present, to 12 mm long; dehiscence causing valve to twist (1.5) 3-4 turns. Seeds black, smooth, compressed-lenticular, face suborbicular to oblong, slightly longer than wide, generally 9-13 mm long, 8-12 mm wide, 2 mm thick, 10-12 seeds per pod, hilum oblong, 2 mm x 1 mm. Figure 32.

Bentham's Clitoria is characterized as a shrub-treelet with elongate inflorescences bearing numerous flowers that have a short, cup-shaped calyx, and legumes which are conspicuously depressed between the seeds.

PHENOLOGY: This species was collected in flower from July to October, with mature fruits appearing in October. One collection of late June and small buds. This species is unique in the section Brachycalyx with its phenology as an earlier bloomer, as all other species blossom from October through February, with one poorly collected species blooming in late March.

TYPE COLLECTION: ECUADOR. Guyaquil, Dr. Sinclair s.n. (LECTOTYPE: K-32, hb. Hookerianum, 1867; S - photo of K specimen). Bentham cited only the Sinclair specimen but did not indicate where it was deposited. The only duplicate seen was selected as the lectotype, although it is

Figure 32. Clitoria brachystegia. (a) leaflet, x 1; (b) juvenile inflorescence, x 1; (c) inflorescence, x 1; (d) calyx, x 1; (e) vexillum, x 1; (f) ala and carina, x 1; (g) androecium, x 1; (h) gynoecium, x 1; (i) flower with immature fruit, x 1; (j) legume, x 1; (k) three views of seed, x 1. (Holway & Holway 1000, GH: a,c-i. Hitchcock 21229, NY: b. Wiggins 10895, US 2170652: j-k.)





atypical in that the leaves are nearly glabrate. However, other collections have both the typical pubescent leaves as well as those that are nearly glabrate. This specimen is probably a duplicate of the type specimen that Benthham saw because it was added to Hooker's herbarium over two decades after Benthham described the species. The location of the specimen that Benthham saw is unknown.

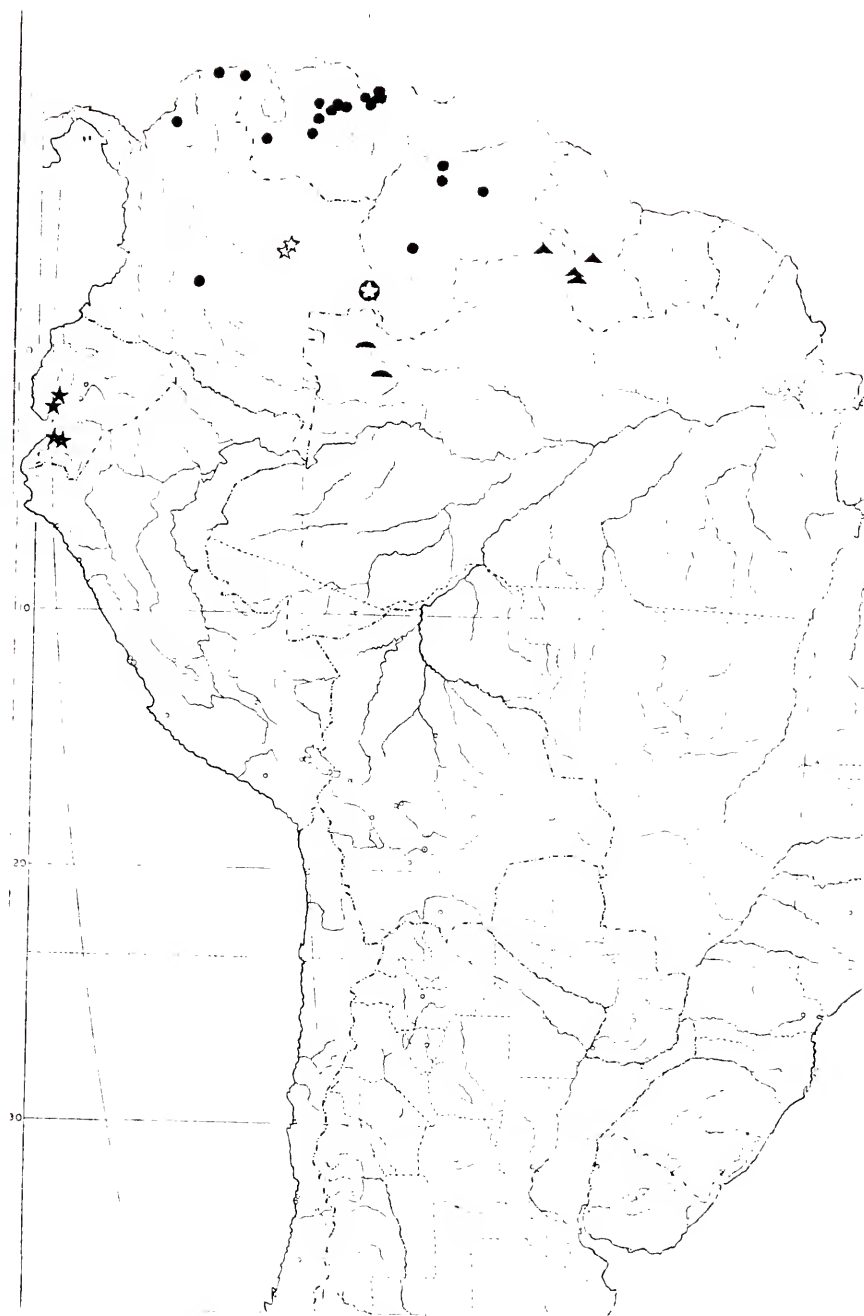
VERNACULAR NAME: ECUADOR: Flor de la reina, Mexia 6557.

NOTES: The origin of Benthham's specific epithet "brachystegia" (brachy = short; stegium = a roof or covering) is unclear. Based upon the specimens of Clitoria species that Benthham saw, this species is distinctive with its short, cup-shaped calyx. One can speculate that Benthham's name was based upon the short calyx which covered the floral and reproductive structures. The only other species with a cup-shaped calyx was described by Harms in 1921, well after Benthham's death. Clitoria brachycalyx Harms is easily distinguished by its broadly oval to suborbicular leaves, densely velutinous below and minutely hirsute above at maturity, its shorter inflorescences bearing smaller flowers, and the much longer stalked fruits.

DISTRIBUTION (Figure 33): This species is an endemic in the Ecuadorian states which surround the Gulf of Guayaquil. Scant data are available on the habitat, recorded once from "open woods" and once from "alongside stream." Individuals have been recorded at elevations from 50-1150 m.

E C U A D O R. LOS RIOS: Hacienda Santa Lucía, Canton Vines, ca 50 m, 18-28 Oct 1934, Mexia 6557 (NY,US). GUAYAS: secus fluvium Daule, ca 400 m, Jul 1876, Andre 2571 (NY): Huayaquil, Ruiz & Pavon s.n. (BM); Sta. Ana, pr. Guayaquil, Sodiro s.n. (P); prope Guayaquil,

Figure 33. South American distribution of six species of section Brachycalyx. Clitoria brachycalyx (▲); C. brachystegia (★); C. canescens (⊙); C. froesii (◐); C. dendrina (●); C. hermannii (☆).



Oct 1927, Mille s.n. (F). EL ORO: between Hacienda Ingenio to Piedras over Cordillera Marcabeli, 666', 21 Jun 1943, Little Jr. 6685 (F,UC,US); between Curtincapa & Portovelo, 640-1555m, 18 Aug 1943, Steyermark 53971 (F,MO); vic Portovelo, 6-15 Oct 1918, Rose & Rose 23372 (NY,US); near junction Río Luis & Río Amobocas, due S of Portovelo, 2200-2500', 6 Oct 1944, Wiggins 10895 (MO,NY,US); Ríos Amarillo y Calera, ca de Portovelo 680-710 m, 14 Aug 47, Espinosa 1772 (NY); Portovelo, gold mine near Zaruma, 600-1000 m, 30 Aug-1 Sep 1923, Hitchcock 21229 (GH,NY); l.c., 22 Sep 1920, Holway & Holway 1000 (GH); Zaruma, 1150 m, 12 Aug 47, Espinosa 1687 (NY).

UNITED STATES. FLORIDA: Highlands Co., vic. Avon Park (cult.), 10 Aug 51, McFarlin 6453 (MICH).

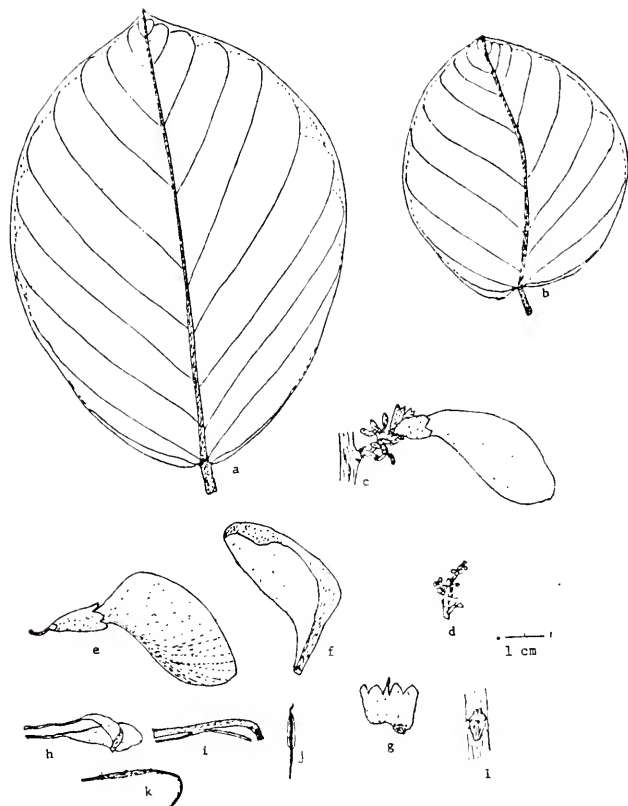
12. Clitoria hermannii Fantz, sp. nov.

Erect shrub, to 2 m tall. Branches to 4 mm diameter, pith solid, pubescence moderately dense, short, appressed to suberect, internodes 2.5-4 cm; axillary bud 3-3.5 mm. Leaves 3-foliate, subcoriaceous, leaflets suborbicular becoming broadly oval as enlarging, apex obtuse, abruptly minutely acuminate, base weakly cordate to rotund, midrib impressed above, primary nerves of 8-10 pair, secondary nerves prominently parallel between the primary nerves, upper surface pubescence moderately soft, short (ca 0.5 mm), appressed, lower surface velutinous, juvenile leaflets 4-7 cm diameter, lamina becoming 10-12 cm long by 7-9 cm wide. Petiole elongate, 6.5-15 cm, pubescence appressed, dense; rachis (1.5) 2-2.5 cm. Petiolules quadrangular, tomentose, 5-8 mm. Stipules caducous, not seen; stipels caducous, linear, acute,

sparsely pubescent, 3-nerved, 2-2.5 mm long, 0.5 mm wide. Inflorescence axillary, at denuded nodes, subpaniculate, axes crowded toward branch apex, pubescence dense, appressed, central axis short, 1.5-2 cm, primary lateral branches which bear the pedicels short, subsessile to 4 mm. Pedicels 5-7 mm. Bracts persistent, middle pair, ovate, obtuse, pubescence dense, appressed, 1.5-2 mm long, 1 mm wide. Bracteoles minute, ovate to suborbicular, obtuse, pubescence dense, appressed, 2-3 mm long, 2 mm wide, inserted at the base of the calyx. Flowers white to faintly orchid, medium-sized, 4.8-5.2 cm. Calyx short-tubular, pubescence dense, appressed, tube 11-13 mm long, width 5-6 mm wide at base to 8-9 mm wide at throat, lobes minute, broad ovate-deltoid, 3-4 mm long, 2-2.5 mm wide, ventral lobe 4-5 mm long. Vexillum pubescence dense, appressed, tawny, blade ca 3 cm wide, claw broadly cuneate, 8-9 mm. Alae extended well beyond carina, 6-9 mm, blade 19-23 mm long, 6-10 mm wide, claw 13-15 mm. Carina blade falcate, 10-12 mm long, 4 mm wide, claw 21-24 mm. Stamens diadelphous, vexillary stamen coherent near middle with tube, free above and below; tube 24-26 mm long, pubescence undinate near apex, free filaments 2-5 mm; anthers lanceolate, 2-2.5 mm long, 0.5 mm wide, connective long apiculate. Gynophore 5 mm, with a few spreading white trichomes near apex; ovary 14-15 mm long, 1.25 mm wide, pubescence white slightly tinged yellow; style 16-17 mm long, geniculate 7-8 mm from distal end; stigma subcapitate, 0.5 mm diameter. Legume unknown. Figure 34.

Hermann's Clitoria is characterized as a shrub with short, subpaniculate inflorescences bearing medium-sized white flowers that have a shortened calyx with minute lobes, and bears leaves which are soft above and velutinous below.

Figure 34. Clitoria hermannii. (a-b) leaflets, x 1; (c-d) inflorescences, x 1; (e) flower, x 1; (f) vexillum, x 1; (g) calyx, x 1; (h) ala and carina, x 1; (i) androecium, x 1; (j) anther with apiculate connective, x 5; (k) gynoeceium, x 1; (l) leaf scar and axillary bud, x 1. (Hermann 11019, NY: b. Hermann 10994, GH: a; NY: c-l.)





PHENOLOGY: Collections of this species were made with flowers in mid-January.

TYPE COLLECTION: COLOMBIA. Vichada: shrub, 18 in., almost leafless, fl. white, grassy llanos, along Rio Vichada, San José de Ocuné, 100 m, 19 Jan 1944, Hermann 10994 (HOLOTYPE: NY. Isotype: GH).

The specimen selected as the holotype had the best flowering material, including a dissected flower in the packet, which this author placed in a cellophane envelope.

NOTES: This species appears similar to C. dendrina and C. brachycalyx in appearance of its leaves, but has larger flowers and smaller stipules, with a number of other structures having close affinities to C. brachystegia. Clitoria brachystegia is easily distinguished by its elongated inflorescences and acuminate leaflets which are pilose below.

DISTRIBUTION (Figure 33): This species is known only from the type locality near San José de Ocuné, Colombia, at an altitude of 100 m, in grassy llanos.

C O L O M B I A. VICHADA: 6 km NE of Masaguara on llanos along Rio Vichada, ca 36 km NE of San José de Ocuné, 100 m, 21 Jan 1944, Hermann 11019 (Paratypes: NY, US 1879110).

13. Clitoria glaberrima Pittier, Bol. Soc. Venez. 8: 264. 1943.

Tree, 3-12 m tall, 8.5-38 cm dbh. Branches 3-7 mm thick, pith hollow, terete, longitudinally striate to sulcate, pubescence of juvenile branches uncinat and short-appressed, soon becoming glabrous. Leaves 3-foliate, light green concolorous, thick-membranous, leaflets

ovate to ovate-elliptic, apex abruptly narrowed to an acumen 1-2 cm long, 2-8 mm wide, extreme apex acute to obtuse, mucronate, base rotund, midrib impressed above, primary nerves of 7-10 pair, upper surface glabrous, lower surface glabrous or occasionally with sparse trichomes subappressed on midrib, lamina 6-16 cm long, 3-9 cm wide, terminal leaflet conspicuously larger than lateral leaflets. Petioles striate longitudinally, somewhat twisted, glabrous to sparsely pubescent, 3-9 cm; rachis 1-4 cm. Petiolules subquadangular, rugose, glabrous, 5-7 (9) mm. Stipules caducous, lanceolate, acute, pubescence uncinata and sparse, short, appressed, apex ciliolate, 5-7 mm long, 1.5-2 mm wide; stipels caducous, linear to subulate, 4-7 mm long, 0.4-0.8 mm wide. Inflorescence axillary and at denuded nodes, contracted, several-flowered, racemose, axis pubescence sparse, appressed, to 1 cm long. Pedicels with uncinata pubescences 3-5 mm long, becoming 7-9 mm long and lignose in fruit, 2-3 mm thick. Bracts ovate to ovate-lanceolate, acute, pubescence uncinata, middle bracts persistent, 3-5 mm long, 1-2 mm wide. Bracteoles deciduous, lanceolate, acute, pubescence uncinata, 3-5 mm long, 1.5 mm wide, inserted 0.5-2 mm below the calyx. Flowers white with deep blue to purple marginally on the vexillum and darker purple veins within, alae and carina white to white tinted purplish, flowers small, 2.5-4 cm. Calyx with uncinata pubescence to glabrate, tube short, 7-12 mm long, width 3-5 mm near the base to 5-7 mm wide at the throat, lobes broadly deltoid, acute to rarely short acuminate to subulate, ciliolate, 2-3 mm long, 2-3 mm wide at base, rarely to 5 mm long with the subulate tip present, ventral typically ca 1 mm longer. Vexillum with uncinata pubescence, blade 2-2.5 cm wide, claw 7-8 mm. Alae extended beyond carina 4-6 mm, blade

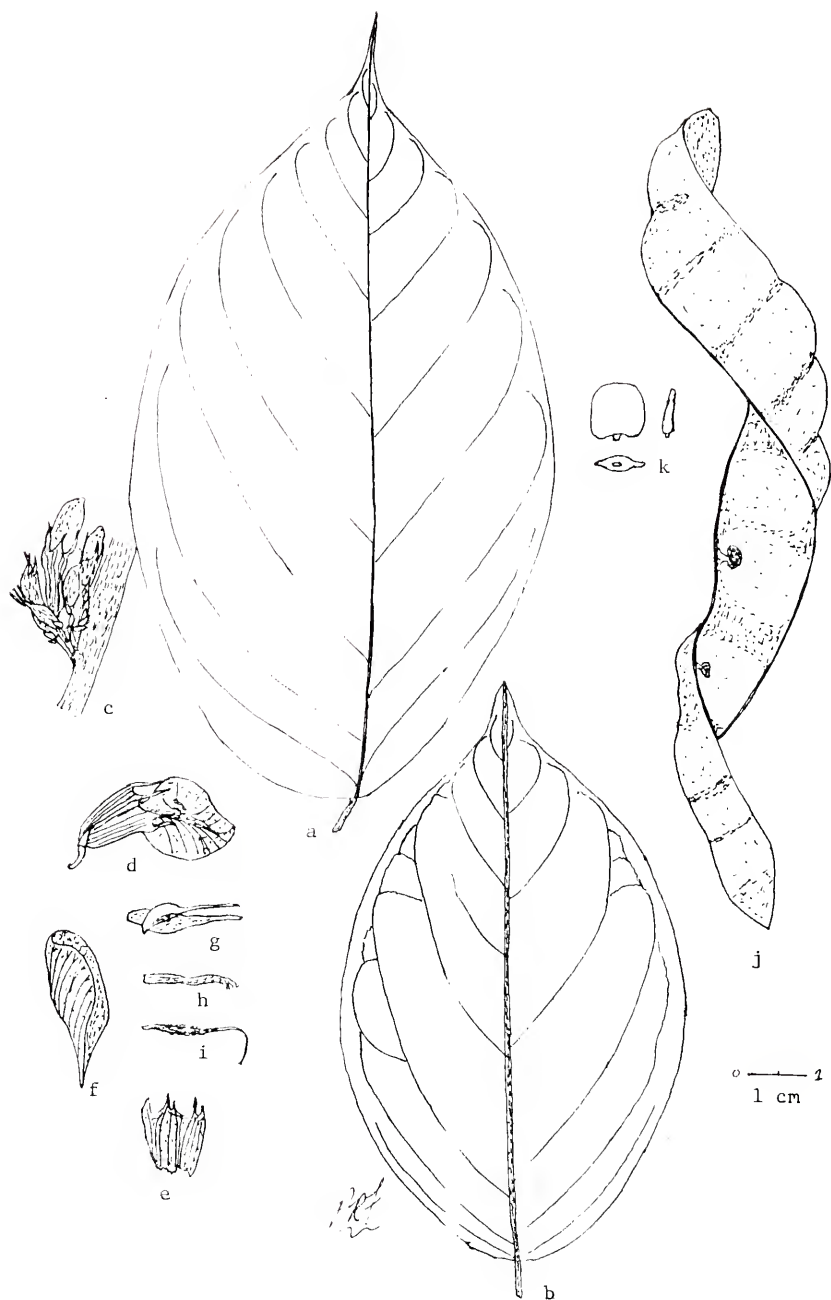
oblong-spatulate, 12-18 mm long, 5-7 mm wide, claw 8-12 mm. Carnia falcate, blade 8-10 mm long, 4-5 mm wide, claw 14-21 mm long. Staminal tube nearly straight, glabrous, 18-21 mm long, free filaments 2-3 mm; anthers 1-1.4 mm long, 0.6 mm wide. Gynophore 1-2 mm, uncinately pubescent; ovary 10-13 mm long, 1 mm wide; pubescence sericeous, white, style 11-13 mm, geniculate 5-7 mm from distal end; stigma capitate, ca 0.5-0.6 mm diameter, pubescent around base. Legume short-stipitate, more or less included within the calyx, yellow-green, coriaceous, flat, depressed between the seeds, pubescence uncinately and sparsely pilose, (8) 11-20 cm long, 16-20 mm wide; stipe with uncinately pubescence, 10-12 (14) mm long, 2-3 mm thick expanding to 5-7 mm thick apex, weakly twisted; beak 5-9 mm; dehiscence 1-1.5 turns. Seeds brown to very dark brown, smooth, compressed lenticular, face suborbicular to slightly longer than wide, base truncate, 8-10 mm long, 7-10 mm wide, 2-3 mm thick, (4) 7-12 seeds per pod. Figure 35.

The Glabrate Tree Clitoria is characterized as a tree with glabrous leaves, short inflorescences bearing small whitish-purple flowers and fruits which are sublomentaceous, and possessing a short tubular calyx with minute lobes and inconspicuous uncinately trichomes.

PHENOLOGY: Flowers are borne from August to December (rarely March) with juvenile fruits appearing in October and maturing through January. Two collections from June and July bore old fruits or fragments of the legume valves.

TYPE COLLECTION: VENEZUELA. Miranda: Tree, ±4 m, thickets near town, Santa Lucia, 160 m, 6 Mar 1943, Killip & Tamayo 37021 (LECTOTYPE: VEN 4009! Isotypes: F 1158369! GH! NY! K-not seen).

Figure 35. *Clitoria glaberrima*. (a-b). Leaflets, x 1; (c) inflorescence, x 1; (d) flower, x 1; (e) calyx, x 1; (f) vexillum, x 1; (g) ala and carina, x 1; (h) androecium, x 1; (i) gynoecium, x 1; (j) legume, x 1; (k) three views of seed, x 1.  
(d'Heuvert 837, NY 2486: b, e-i. Pittier 37021, A: a,c-d.  
Lewis, Dwyer, & Elias 8, US 2572166: j. Pittier 6647,  
US 716707: k.)



Pittier cited three collections, indicating the Killip & Tamayo 37021 as the type, but failed to establish at which institution the specimen he had examined was located. The Caracas specimen (VEN) is treated as the holotype because this author is convinced that it was the specimen examined by Pittier and labeled by him as the type. This conclusion is based on the following evidence: (1) the VEN specimen is marked "tipo" whereas all other specimens are marked "type coll."; (2) the Caracas Institution is the only herbarium known to have one sheet of each of the three cited collections; (3) the Caracas specimen was the only one to have fragments of the legume, which was described by Pittier; (4) the Caracas specimen was also the only one to possess a dissected flower; its measurements agree with the published description; (5) the Caracas specimen included attached sheets which illustrated the flower structures, some of which were published with the description; (6) the description was published in a technical bulletin associated with the Caracas Institution; and (7) Pittier was associated with the Caracas Institution, thus, more likely to have examined a VEN specimen than one from another institution. From the collective evidence, the Caracas specimen (VEN 4009) is the holotype.

VERNACULAR NAMES: VENEZUELA (Miranda): Carauto, Pittier 7074; (Carabobo) Anima, Saer 837, PANAMA (Panama): Peronil, Pittier 6799.  
EL SALVADOR: Chapelno, Calderon 1228 & 1428.

NOTES: Although Clitoria glaberrima has been frequently collected in Panama, it remains a relatively unknown species to botanist. As a result, these specimens were usually identified as C. arborescens, a name historically applied to an array of arborescent-like Clitorias. Part of the confusion may lie in R. Brown's description of C. arborescens,

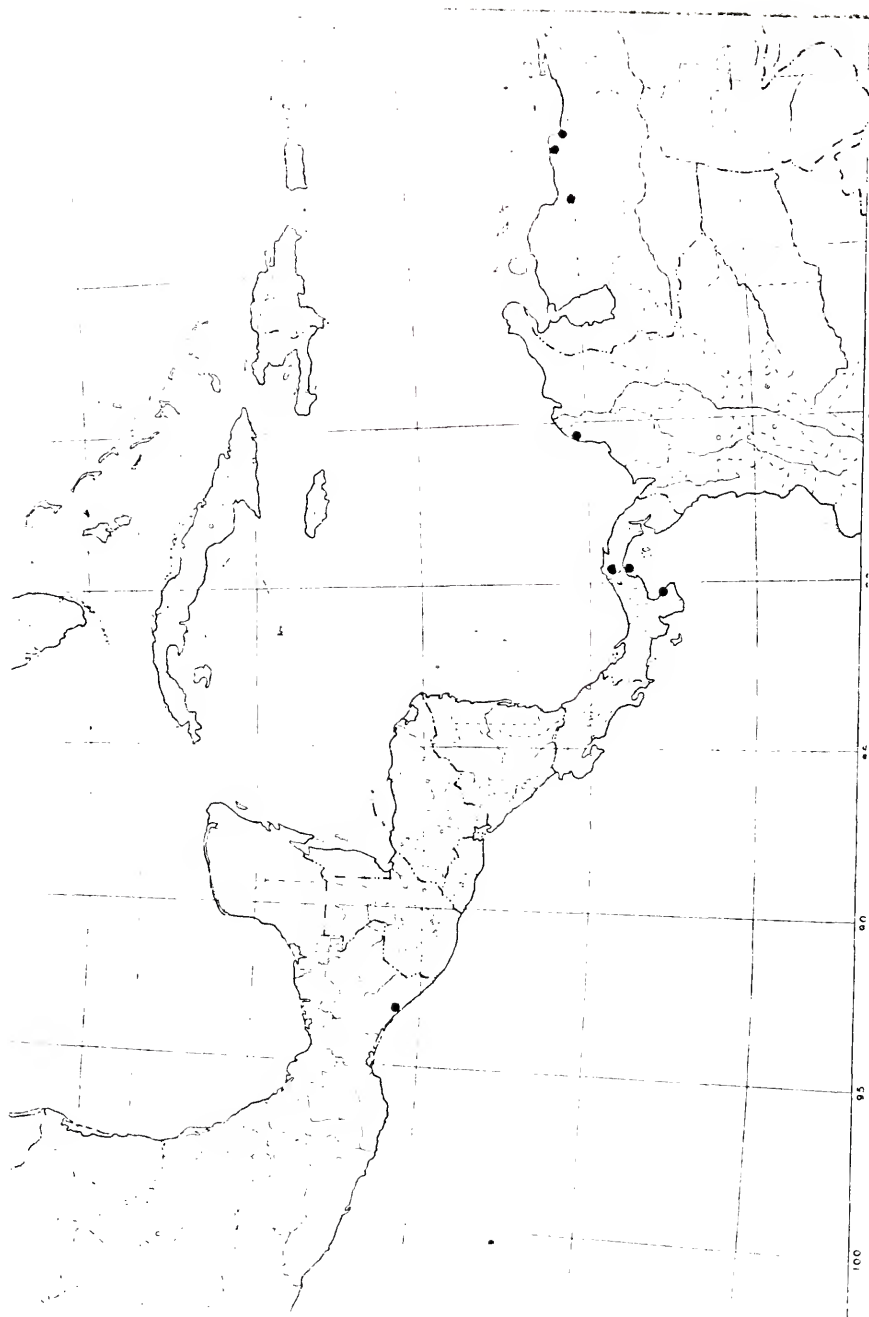
"*C. foliis ternatis, pedunculis multifloris, gemine tomentoso, stylo villosa, caule arborescenti*," a description so vague that it could fit almost all of the members of the subgenus Bractearia. A second Panamanian species, *C. javitensis*, was usually included with *C. glaberrima* under the name *C. arborescens*. Each name applies to a distinct species. *Clitoria arborescens* is easily distinguished from *C. glaberrima* by having leaves tomentose below, elongated inflorescences, conspicuously long bracteoles (8-15 mm), and medium-sized flowers (4-6 cm). *Clitoria javitensis* is easily distinguished by its large flowers (5.5-8 cm), elongate calyx tube (17-24 mm), ovary with rufous trichomes, and fruit with dense rufous pubescence. Croat (1974) was the first to associate correctly the name *C. glaberrima* with the Panamanian members of this species.

The Venezuelan material usually differs from the Central American specimens by usually having stipels and calyx teeth with an aristate apex. However, occasionally one can observe a flower with aristate calyx lobes on a Central American specimen which also has other flowers whose calyx lobes are acute, lacking the subulate tips. Although the minute stipels were not seen in Central American specimens, stipel scars were evident. This distinction does not warrant nomenclatural recognition.

**DISTRIBUTION** (Figure 36): This species is found in dry tropical forests from Venezuela to Southern Mexico, but it is poorly represented in collections outside of Panama, with four collections from Venezuela, and one collection each from Colombia, Costa Rica, El Salvador, Guatemala, and Mexico. It has been collected at elevations from 150-1700 m.

Figure 36. Central and South American distribution of Clitoria  
glaberrima, section Brachycalyx.





V E N E Z U E L A. MIRANDA: bosques de Galipan arriba de Caracas, 1600-1700 m, 4 Nov 1917, Pittier 7576 (Paratype: VEN 4011); Cárdenas, Guinard Estate, Squire Valley, 400-800 m, Pittier 7074, 25 Mar 1917 (G-2 sh.) and 5-7 Apr 1917 (G-2 sh.,US). CARABOBO: orillas del Rio Cabrialeo, Carabobo, Nov 1941, Saer 837 (Paratype: VEN 4008. Isoparatype: NY).

C O L O M B I A. Carthagena, Miller s.n. (BM).

P A N A M A. 6 Jun 1914, Pittier 6647 (US); Toboga Isl., 30 Oct 1917, Killip 3180 (US); l.c., on the Morro, 1 Oct 1862, Hayes 687 (K,M); Alhojuela, Bro. Paul 496 (MICH,US). LOS SANTOS: Las Tablas, 28 Jul 1962, Dwyer 1180 (MO). PANAMA: Ag. Exp. Station at Matias Hernandez, 8 Oct 1914, Pittier 6799 (GH,K,M,P,US); Isla Tabaguilla, 20 Oct 1962, Duke 5882 (MO). CANAL ZONE: Farfan Beach Area, 23 Oct 1965, Tyson 1833 (MO,US) and 1839 (MO); l.c., 19 Dec 1965, Tyson & Blum 2606 (MO,US) and 2618 (MO,US) and 2619 (MO) and 2620 (MO); l.c., 26 Jan 1966, Tyson, Dwyer, & Blum 3172 (GH,MO); hill above Thatcher Ferry Bridge, 22 Aug 1971, Croat 17012 (MO); Madden Dam, 50 ft, 3 Dec 1966, Lewis, Dwyer, & Elias 8 (MO,UC,US); l.c., 1938, Woodson, Allen, & Seibert 1553 (GH,MO,US); l.c., Boy Scout Camp Road, 22 Jan 1968, Dwyer 8387 (MO); l.c., 27 Aug 1969, Dwyer 9166 (MO); 1 mi beyond Madden Dam Bridge, 12 Oct 1967, Correa & Dressler 353 (MO).

C O S T A R I C A. El Coyolar, Jan 1931, Lankaster 1283 (F,S).

G U A T E M A L A. Intro. en Envoy Java et la Tortuga, Nov 1877, Bernoulli & Cairo 1177 (K).

E L S A L V A D O R. La Cebadilla, 1922, Calderón 1228 (GH,NY) and 1428 (MO-2 sh.).

M E X I C O. CHIPAS: Pijijiapan, 200 m, 24 Dec 1949, Matura  
18734 (NY).

14. Clitoria canescens Pittier ex Fantz, sp. nov.

Clitoria canescens Pittier, nom. in sched.

Shrub. Branches 4-6 mm diameter, subterete, pith solid, internodes weakly zigzag, juvenile branches with pubescence uncinata plus scattered, short, appressed trichomes, becoming glabrous; bark dark brown, smooth, splitting in longitudinal strips, dark tan beneath; axillary buds 3 mm, scales ovate, short strigose; leaf scar suborbicular, vascular bundle scars inconspicuous. Leaves 3-foliate, coriaceous, long-petiolate, leaflets lanceolate-elliptic, apex acuminate (acumen damaged in specimen, mostly lacking), base broad cuneate, midrib impressed above appearing as a shallow groove, primary nerves of 9-10 pair, upper surface faintly glossy, dark green, glabrous, lower surface dull, green, pubescence short, appressed, inconspicuous on nerves, lamina 15-17 cm long, 6-7 cm wide. Petioles subquadrangular-terete, 9 cm long; pubescence scattered, uncinata with some appressed trichomes; rachis 3.5 cm. Petiolules subquadrangular, rugose, dark-colored, glabrate, 8-10 mm. Inflorescence terminal, racemose-nodose to subpaniculate (?), pedicels borne on central axis at lignose knobs or occasionally on a secondary lateral branch, 6-7 mm long; axes dark-colored, compressed laterally, subquadrangular, twisting, pubescence moderately dense, short, appressed, central axis 1.5-3.5 cm long or more (??, apex broken). Pedicels strigose, dark-colored, 6 mm. Bracts minute, ovate, acute, strigose; middle pair semipersistent, 1-2 mm long, 0.5-1 mm wide, outer

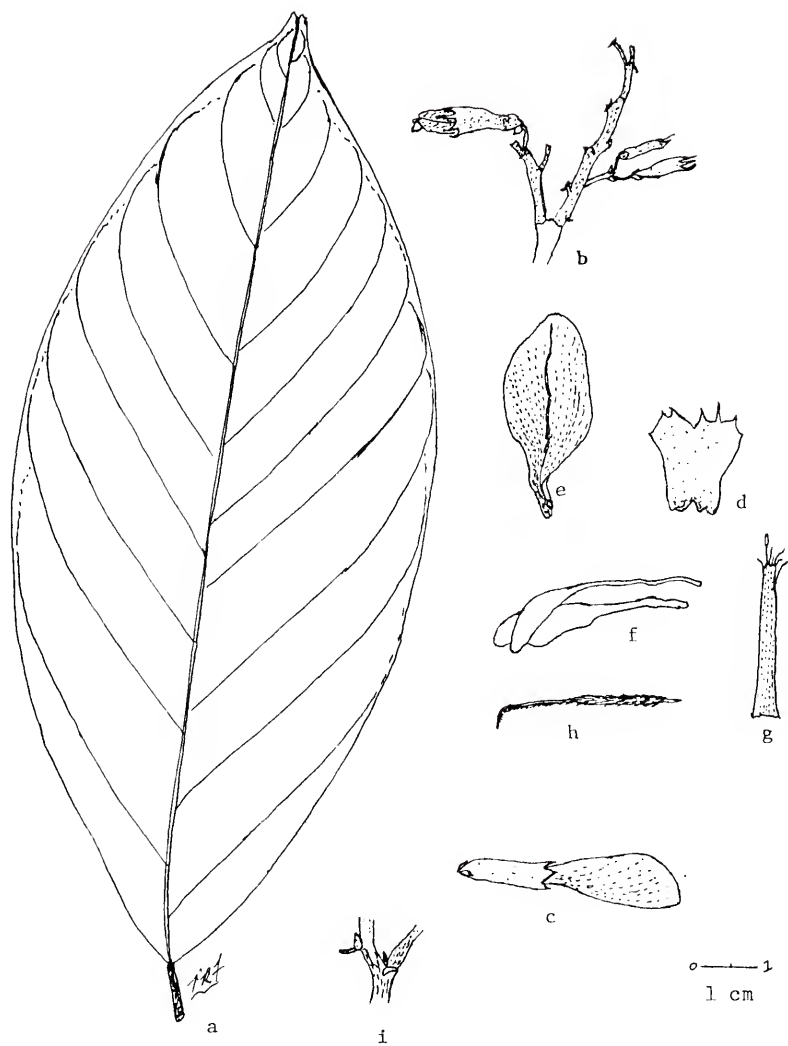
bract deciduous, narrow, 1 mm long, 0.5 mm wide. Bracteoles minute, ovate, inserted at calyx base to 1 mm, strigose, acute to short acuminate, 2-3 mm long, 1-1.5 mm wide. Flowers small, 3.5 cm long, color unknown (purple? - dry state appearance similar to C. dendrina which has dull to dark purple flowers). Calyx dark-colored, pubescence moderate, short, appressed (buds densely pubescent, subcanescent), tube short, 13-15 mm long, width at base 3-4 mm broad to 7 mm wide at throat, lobes minute, broad deltoid, short acuminate, 3-4 mm long, 2.5-3 mm wide at base, ventral lobe linear, 6 mm long, 0.5-0.7 mm wide. Vexillum dark-colored, pubescence dense canescent dorsally, trichomes appressed, minute, blade obovate, 1.5 cm wide, claw 6-7 mm long, 2-3 mm wide, cuneate. Alae extended beyond the carina 4-5 mm, blade 17 mm long, 3-5 mm wide, claw 16 mm. Carina flaccate, acute, blade 16 mm long, 4-5 mm wide, claw 20 mm. Androecium diadelphous, staminal tube glabrous, 28 mm long, free filaments 3-5 mm, alternately long and short; anthers lanceolate, 3 mm long, 0.5 mm wide. Gynophore 3 mm long brownish-black, moderately densely sericeous, trichomes white; ovary 13 mm long, 1 mm wide, blackened, pubescence very dense, sericeous, white; style blackened toward base, white sericeous pubescence towards base, beard moderately dense, 18 mm long, geniculate 3-4 mm from apex; stigma dark-colored, compressed, 0.5 mm diameter. Legume unknown.

Figure 37.

Pittier's Canescent Clitoria is characterized as a shrub with short racemose-subpaniculate inflorescences bearing small canescent flowers that have a long brachycalyx with minute lobes.

PHENOLOGY: The only collection of the flowers was made in late March.

Figure 37. *Clitoria canescens*. (a) leaflet, x 1; (b) two inflorescences, x 1; (c) flower, x 1; (d) calyx, x 1; (e) vexillum, x 1; (f) ala and carina, x 1; (g) androecium, x 1; (h) gynoecium, x 1; (i) node with axillary bud, stipule scar, and base of petiole, x 1. (Williams 14893, VEN 4038: a-i.)



TYPE COLLECTION: VENEZUELA. Amazonas: sitios arenoso de la boca del Gahama, Cano S. Miquel, Guaima, alto Rio Negro, 26 Mar 1942, Williams 14893 (HOLOTYPE: VEN 4038).

This specimen bore the name "Clitoria canescens Pittier, sp. nov." on the label and was placed in a separate folder bearing this name. No record of the publication of this species has been found. Pittier (1944) did not include this species in his key to the Clitorias of Venezuela. Since the specimen was collected in 1942, it is presumed that Pittier saw this specimen after his publication, at which time he recognized it as a new species and gave it a name.

NOTES: The dried flowers of this species suggest C. dendrina more than any other species, although C. canescens differs by the canescent vexillum, longer style, calyx tube, and some of the petal structures. In addition, the leaves are glabrous above, the inflorescence is less crowded with flowers and bears secondary lateral branches, and the ovary pubescence lacks any yellowish pigmentation. The leaves appear similar to C. brachystegia and C. glaberrima. Clitoria brachystegia is easily distinguished by its larger flowers, its elongated inflorescences, and many differences in reproductive structures. Clitoria glaberrima is easily recognized by its shorter inflorescences, calyx with uncinatate pubescence, glabrous leaves, and differences in several flower structures. There is also a superficial resemblance to some specimens of C. javitensis which have immature flowers present. This species can be easily distinguished from C. canescens by the longer calyx tube (16-24 mm) and lobes (4-6 mm), the long-clawed vexillums (16-19 mm), and ovaries with rufus pubescence. The minute calyx lobes and smaller flower size, plus a shorter calyx, suggest that C. canescens is better

placed in section Brachycalyx where it has close affinities with C. dendrina and some of the characteristics of C. brachystegia & C. glaberrima, than placed in section Cauliflorae next to C. javitensis which it superficially resembles.

DISTRIBUTION (Figure 33): This species is known only from the type collection.

15. Clitoria brachycalyx Harms, in Fedde Report. Spec. Nov. Regni Veg. 17: 444. 1921.

Erect shrub to small tree, 5-12 m tall. Branches to 8 mm diameter, pith solid to occasionally hollow on larger sized branches, juvenile branches blunt-angled, somewhat subquadrangular, soon becoming terete, longitudinally striated, pubescence dense, rufus, erect to spreading with a few appressed trichomes, becoming glabrate with scattered macro-trichomes and uncinat trichomes now conspicuous, then glabrous; axillary buds 2 mm long, scales ovate, acute, pubescence strigose. Leaves 3-foliate, thick membranous, leaflets broad ovate to elliptic-ovate or ovate, apex generally broadly obtuse, occasionally obtuse and abruptly acuminate, acumen to 0.5 cm, infrequently slightly longer, more or less mucronate, base broad rotund, midrib impressed above, primary nerves of 7-9 pair, upper surface pubescence of moderately dense, minute, erect stiff hairs (ca. 0.1-0.2 mm), texture similar to fine sandpaper, lower surface slightly lighter green, pubescence short velutinous, conspicuously dense along the nerves, soft to the touch, lamina generally 8-16 cm 6-12.5 cm wide. Petioles subterete, (5) 7-15 (18) cm; pubescence of uncinat and sparse to dense, appressed,



short macro-trichomes; rachis 3-4.5 cm. Petiolules subquadrangular, pubescence dense, rufus, spreading, 7-10 mm. Stipules deciduous, lanceolate, weakly striated, often weakly arcuate, 4-6 mm long, 1-2 mm wide; pubescence moderate, appressed, ciliate; stipels linear to lanceolate, 3-7 mm long, 0.3-1 mm wide, uncinata, pubescent with a few appressed trichomes, terminal stipel narrower and shorter.

Inflorescence appearing before the leaves, from denuded nodes and axillary, racemose, nodose; axes angular, slightly twisting, pubescence dense, minute, erect to appressed, 1.5-7 cm long, multiflowered, lignose and similar to old branches in fruit. Pedicels 5-8 mm long, lignose and elongated to 7-12 mm in fruit. Bracts minute, inconspicuous, ovate, broadly acute, pubescence appressed, middle pair 1-2 mm long, 1-1.5 mm wide. Bracteoles minute, inconspicuous, ovate, broadly acute, weakly striated, 2-3 mm long, 1.5-2 mm wide, inserted 1-2 mm below the calyx base in flower to occasionally located 2-4 mm below the calyx in fruit, pubescence appressed. Flowers small, 2.5-4 cm, white with cream to pink to lilac veins on the ventral face of the vexillum. Calyx short, cup-shaped, pubescence dense, minute, appressed to suberect, tube 7-11 mm long, 5-7 mm broad at base expanding to 8-12 mm at throat, width of tube at throat subequaling its length, lobes minute, broadly deltoid, apex broadly acute, width slightly more than length, 2-3 mm long, 3-4 mm wide at base, ventral lobe subequaling other lobes, slightly narrower. Vexillum pubescence dense, tawny, appressed, blade 2.5-3.5 cm wide, claw 4-5 mm. Alae extended beyond carina 4-7 mm, blade 15-22 mm long, 5-10 mm wide, claw 10-17 mm, with densely uncinata pubescent. Carina falcate, with uncinata pubescence, blade 10-14 mm across, 3-5 mm wide, claw 16-21 mm. Staminal tube 23-31 mm long, more or less

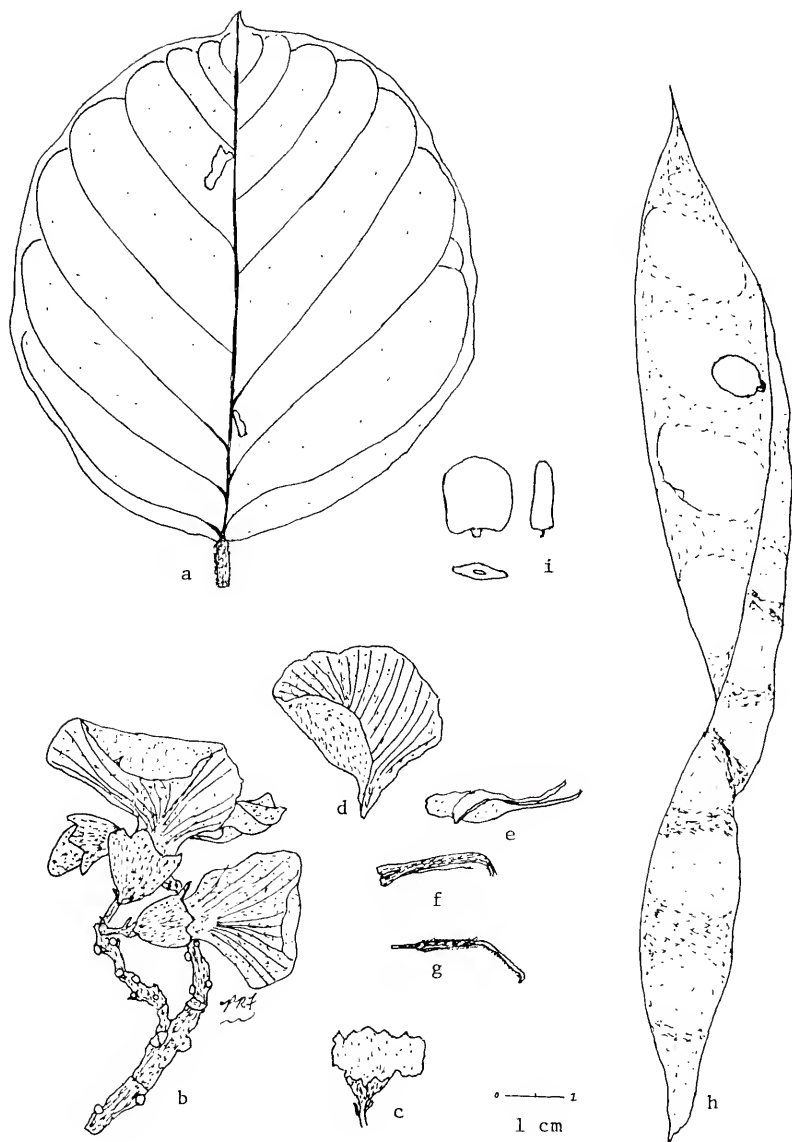
uncinate pubescent at apex, free filaments glabrous, 2-4 mm; anthers lanceolate, apiculate, 1.7-2.3 mm long, 0.5-0.8 mm wide. Gynophore 6-7 mm, moderately dense sericeous; ovary 11-13 mm long, 1.2-1.5 mm wide, pubescence sericeous, white; style 11-16 mm long, geniculate 6-8 mm from distal end; stigma capitate, 0.5-1 mm diameter, densely pubescent at base. Legume long-stipitate, exerted well beyond the calyx, flat, becoming depressed between the seeds, base attenuate, 12-19.5 cm long, 16-26 (30) mm wide, pubescence dense, short, erect, reddish-brown, soft to the touch; stipe short, erect, 28-45 mm long, 2-3 mm thick expanding to 4-5 mm at apex, pubescence moderately dense; beak 6-15 mm when present; dehiscence causing valves to twist one-quarter to three-quarters of a turn. Seeds lenticular, smooth, face orbicular to slightly wider than long or occasionally longer than wide, brown soon turning black beginning near the placenta, generally 10-13 mm long, 10-13 mm wide, 2-3 mm thick, (4) 7-10 seeds per pod; hilum 2 mm x 1 mm. Figure 38.

Harm's Clitoria is characterized as a tree with leaves conspicuously pubescent on both surfaces and bearing small flowers with a conspicuously short, cup-shaped calyx, and developing rufo-pubescent, sublomentaceous fruits which are well exerted beyond the calyx.

PHENOLOGY: This species blooms from October through February with mature fruits collected in March and April. Leaves are deciduous during the flowering period, usually appearing after the flowers have appeared on the plant. One collection, Irwin 647, was collected with flowers in mid April.

TYPE COLLECTION: BRAZIL. Rio Branco, Surumu, camp de Serra de Mairary, Feb 1909, Ule 8398 (LECTOTYPE: K-31).

Figure 38. Clitoria brachycalyx. (a) leaflet, x 1; (b) inflorescence, x 1; (c) calyx, x 1; (d) vexillum, x 1; (e) ala and carina, x 1; (f) androecium, x 1; (g) gynoecium, x 1; (h) legume, x 1; (i) three views of seed, x 1. (Smith 3393, S: a,h-i. Smith 3128, S: b,g.)



Harms cited only the Ule collection, but did not designate the location at which the specimen was deposited. It was probably deposited at Berlin, and therefore, now destroyed by fire during World War II. The Kew specimen is the only type duplicate seen, and therefore was selected as the lectotype. However, this specimen does not bear any leaves, which must have been present on the type collection since Harms described the leaves.

NOTES: Harms noted that C. brachycalyx had weak affinities with C. grandifolia Ducke (= C. javitensis var. grandifolia). Both species have similar fruits with rufous trichomes, although the fruits of C. javitensis are slightly swollen around the seeds, nearly flat to weakly depressed between the seeds, unlike C. brachycalyx. Both species have long inflorescences. But C. javitensis is conspicuously different with a long calyx tube (17-24 mm) and distinct lobes (4-8 mm), large flowers (5.5-8 cm), and with leaves glabrous above and the pubescence below moderate to sparse or lacking.

Clitoria brachycalyx has close affinities with C. dendrina from which it is easily recognized by its cup-shaped calyx, white to pink flowers, longer staminal column, and shorter bracts and stipules. The unique cup-shaped calyx of C. brachycalyx is found only in one other species, C. brachystegia of Ecuador. Despite the similarity in calices, C. brachystegia is a more distant relative of C. brachycalyx and C. dendrina. Clitoria brachystegia has larger flowers, narrower legumes, longer ovaries, and shorter stipules.

DISTRIBUTION (Figure 33): Clitoria brachycalyx is an endemic of westcentral Essequibo, Guyana, and adjacent Brazil. The species has been collected predominately in the Kanuku Mountains of Guyana, with

the type collection representing the only Brazilian locality known.

The specimens collected were taken from dense forest to scrub, on sandy to rocky ground or exposed rocky ledges, at elevations of 60-400 m.

G U Y A N A. ESSEQUIBO: Schomburgk 106.5 (K); Wabuwak Kanuku Mts., Oct 43, Wilson & Bronne, Forest Dept. of Br. Guiana 5774 (K,NY); W extremity of Kanuku Mts. in drainage of Takuta River, 300 m, 4-22 Mar 1938, Smith 3128 (A,F,G,K,MO,NY,S,U,US,W); NW slopes Kanuku Mts, drainage of Moku-Moku creek, Takutu territory, 150-400 m, 31 Mar-16 Apr 1938, Smith 3393 (A,F,G,MO,NY,S,U,US,W); 5 mi S of Lethem at Mokokoko creek, 16 Apr 1956, Irwin 647 (US); Watu Ticaba, rec. 20 Jun 67, Appur 2294 (K); Turuk Wav, 5 Dec 1957, Cook 243 (K); Annai, 200', 27 Dec 60, Graham 485 (K).

16. Clitoria dendrina Pittier, Cont. Nat. Herb. 20(3): 126. 1918.

?Heurocarpum macrophyllum H.B.K., Nov. Gen. Sp. 6: 410. 1824.

Clitoria fendleri Rusby, nom. in sched.

Erect shrub to tree, usually 2-11 m tall, rarely to 25 m tall (fide Espina A18) generally to 45 cm diameter, rarely to 100 cm diameter.

Branches to 8 mm diameter, pith hollow, juvenile branches angular, with pubescence dense, tawny, appressed, branches becoming subterete, glabrate with age, trichomes whitening, losing pigmentation; axillary buds 2-3 mm, scales ovate, acute, pubescence appressed. Leaves deciduous, 3-foliate, thick membranous, leaflets very large, generally broad ovate to rhomboid-ovate, oval to orbicular, apex obtuse to abruptly short acuminate, acumen to 0.5 cm or occasionally to 1 cm, base rotund to retuse, subcordate on some large orbicular leaflets,

midrib weakly raised above, primary nerves of 8-10 pair, upper surface pubescence minute, moderately dense, erect, similar to fine sandpaper to the touch from apex to base, with age becoming confined to major nerves, velutinous-tomentose, soft to the touch, becoming less dense, pilose-like with age, lamina generally 10-20 (29) cm long, 8-18 (23) cm wide. Petioles elongate, weakly angular to subterete, 8-16 (23) cm long; pubescence minute velutinous; rachis 3-4.5 (5) cm. Petiolules subquadrangular, 7-10 mm, densely velutinous pubescent. Stipules caducous, rarely observed, lanceolate, acute, 6-8 mm long, 2 mm wide, pubescence appressed; stipels caducous, linear to narrow lanceolate, acute, 3-6 mm long, 0.2-0.8 mm wide, pubescence appressed. Inflorescence from denuded nodes, fascicled, few to several, crowded, short, racemose, nodose, multiflowered, occasionally branched, pubescence of axes dense, appressed, rufous, central axis 1-3 cm long. Pedicels 3-6 mm. Bracts deciduous, minute, ovate, obtuse, pubescence appressed, rufous, middle bracts 2-3 mm long, 1-1.5 mm wide. Bracteoles minute ovate, occasionally suborbicular, obtuse to broadly acute, 1.5-3 mm long, 1.5-3 mm wide, inserted at calyx base, pubescence appressed. Flowers small, 3-4 cm, dull to dark purple. Calyx pubescence dense, minute, appressed, tube short, narrow, scarcely flaring at throat, 7-11 mm long, 3-5 mm wide at base to 5-7 mm wide at throat, lobes minute, nearly equal, broadly deltoid, acute, 2-3 (4) mm long, 2-3 mm wide, ventral lobe 3-4 mm x 1 mm. Vexillum pubescence dense, short, appressed, blade 1.8-2.8 cm wide, claw 4-6 mm. Alae extended beyond the carina by 4-6 mm, uncinately pubescent, blade 14-18 mm long, 3-6 mm wide, claw 10-13 mm. Carina falcate, blade 7-9 mm long, 2-3.5 mm wide, claw 14-18 mm. Stamens diadelphous, vexillary filament coherent below the middle, free

above and below, tube glabrous or occasionally more or less uncinately pubescent toward apex, 16-22 mm, free filaments glabrous, 2-5 mm; anthers lanceolate, apiculate, 1.5-2 mm long, 0.5 mm wide. Gynophore short, 1-3 mm; ovary 9-10 mm long, 1.25 mm wide; pubescence white with yellowish tinge; style dark-colored, 10-16 mm long, geniculate 5-6 mm from distal end; stigma capitate, 0.5 mm diameter. Legume long-stipitate, exerted well beyond calyx, flat, weakly depressed between seeds, 16-20 cm long, 17-24 mm wide, pubescence minute, erect, dense, rufous, of soft velvety texture; stipe pubescence dense, minute, erect, arcuate to geniculate near apex, (18) 24-34 mm long, 2-4 mm wide expanding to 5-7 mm at apex; beak to 7 mm; dehiscence causing valves to twist one-half of a turn. Seeds lenticular, face suborbicular to slightly longer than wide, 9-11 mm long, 8-11 mm wide, 2 mm thick, 7-8 seeds per pod, hilum elliptic, obtuse at both ends, 2 mm x 1 mm. Figures 39 and 40.

Pittier's Arboreal Clitoria is characterized as a tree with large pubescent leaves and very short, fascicled inflorescences from denuded nodes bearing small purple flowers which have a short, narrow calyx with minute lobes, or bearing rufo-pubescent fruits.

PHENOLOGY: This species blooms from (November) December through February with fruits collected from December through March. Leaves are deciduous at this time with a higher percentage of collections lacking leaves in February and March.

TYPE COLLECTION: VENEZUELA. Aragua: Vegas de Rio Lemon cerca de Maracay, 440 m, 27 Jan 1913, Pittier 5773 (HOLOTYPE: US 601479, not seen. Isotypes: G-99! NY! VEN 4029!).



Figure 39. Clitoria dendrina. (a-b) leaflets, x 1; (c-d) inflorescences, x 1. (Wurdack & Monachino 41006, US 2167572: a,c. Wurdack & Monachino 40979, NY: b,d.)

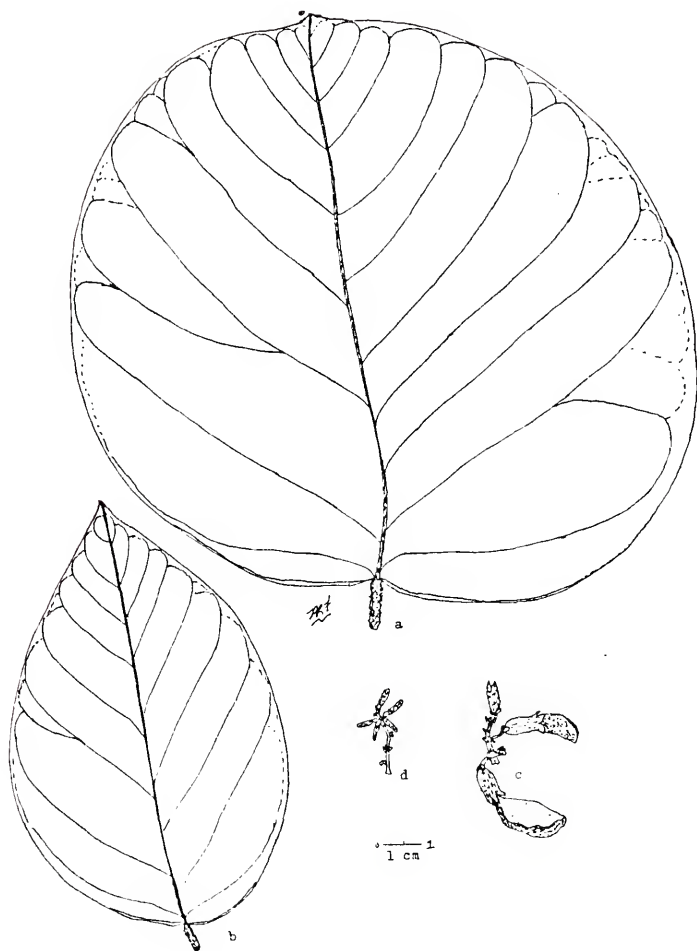
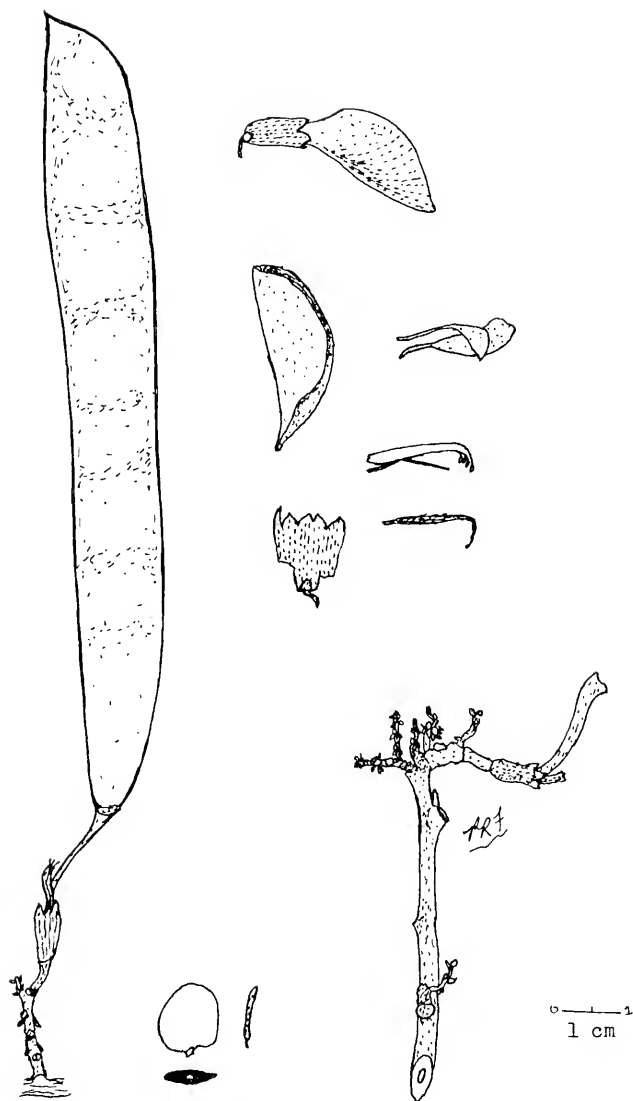


Figure 40. *Clitoria dendrina*. (a) flower, x 1; (b) calyx, x 1; (c) vexillum, x 1; (d) ala and carina, x 1; (e) androecium, x 1; (f) gynoecium, x 1; (g) branch apex with persistent inflorescences, x 1; (h) fruit, x 1; (i) three views of seed, x 1. (Hurdack & Monachino 40979, NY: a-f. Williams 11638, US 1801717: g,i; F 1002908: h.)



The New York and Geneva collections have the label data "La Trinidad de Maracay, 440 m." These specimens may represent a collection from a different site than the type locality of "Vegas de Rio Lemon cerca de Maracay," although placed by Pittier under the same collection number of 5773 as the type. If that is correct, then the New York and Geneva specimens would not be isotypes because they would not be duplicates of the type collection. Both collections are good representatives of the species, although the New York collection lacks fruit.

Stockholm has two photos of Kew specimens (Fendler 305), each specimen collected from a different locality, but labeled as types of C. dendrina Pitt. Pittier never included these Fendler specimens in his original publication in 1918 nor in a later article in 1944. Fendler 305 is not a type for the species, but may be the source for the name selected by Rusby.

Specimens of Smith 925 were distributed from the New York Botanical Garden and labeled "Clitoria fendleri Rusby, sp. nov.," yet the two New York specimens of this collection were labeled C. dendrina. Clitoria fendleri Rusby is a nomina in schedula as no publication of this name has been found.

The name Neurocarpum macrophyllum H.B.K. has been placed in synonymy on a questionable basis. These authors cited no type collection, but they did cite the collection data as "Savaneta incolarum, crescit prope Turbaco Novo-Granatensium, alt. 180 hex. floret Martio." Stafleu (1967, p. 223) placed thetypes for newly described species by these authors at Paris. A Paris specimen, Bonpland 1412 (P-46!), labeled isotype, appears to be a representative of the type collection.

It bears the label data "Mars 1801, Carthagine no. 1412 Turbaco (Nelle Granada), Saverata, Bonpland" which is in agreement with the published type data. This specimen consists of only one mounted leaf, lacking any inflorescence or flowers. A cotype specimen at the Field Museum (F 93/281!) consists of a leaflet fragment (2 cm x 1 cm) taken from the terminal leaflet mounted at the bottom of the Paris sheet. These leaf specimens agree with C. dendrina.

At the top of the Paris sheet, there are two separately mounted leaflets which are non-Clitoria! They are asymmetrical, different in vein pattern, pubescence, and shape. They appear similar to some observed in the genus Erythrina. These leaves do not match the published description of the leaves.

The description of N. macrophyllum agrees with C. dendrina rather well except for two phases, (1) "red flowers" (flowers are dull to dark purple in C. dendrina) and (2) "calyx campanulate-tubular" (calyx narrowly infundibular-tubular in C. dendrina). However, some flowers of C. dendrina have been described as maroon or other similar shades indicating a reddish component. The term campanulate-tubular has been used to describe other species of Clitoria with a similar short calyx. Much of the description, however, could match many species of Clitoria because of the generalized structures described, but the closest fit appears to be C. dendrina.

The history of the name N. macrophyllum H.B.K. is short in the literature and there is no indication that the name was transferred to the genus Clitoria. After the name was published in 1824, de Candolle (1825) treated the species N. macrophyllum H.B.K. as a doubtful species under the genus Neurocarpum. Don (1832) followed de Candolle's

treatment by stating that perhaps this shrub should be removed from the genus Neurocarpum. Bentham (1837) listed N. macrophyllum H.B.K. as a dubious species of Neurocarpum. Steudel (1841) listed N. macrophyllum H.B.K. under the genus Neurocarpum. Then the name disappeared from literature. When Bentham (1858) combined the genus Neurocarpum with the genus Clitoria, the name N. macrophyllum H.B.K. was lacking in his treatment.

If the name N. macrophyllum is accepted as synonymous with C. dendrina, then the Rule of Priority of the International Code of Nomenclature would indicate that this species should bear the name Clitoria macrophylla (H.B.K.) Fantz. However, any transfer of the name would create a homonym with Clitoria macrophylla Wall (1828); thus the name C. macrophylla (H.B.K.) Fantz for this species would be illegitimate.

If additional collections of Bonpland 1412 are located that include the flowers and inflorescence, the questionable status of the synonymy can be ascertained from their examination. Fortunately in either case, whether this author was correct or in error in placing the name N. macrophyllum H.B.K. in synonymy, the name of the species will remain C. dendrina.

VERNACULAR NAMES: VENEZUELA (ARAGUA): Sinverguenza, Tamayo 1649. (BOLÍVER): Generalá, Tamayo 2192; Oreja de tigre, Tamayo 3456, Peonío de cerro, Marcano-Berti 2553. (CARABOBO): Ánima-flor de ánima, Hequert 838; Flor de ruima, Pittier 8669. COLOMBIA (MAGDALENA): Guayacan Polvillo, Espina & Giacometto A18.

NOTES: Clitoria dendrina has close affinities with C. brachycalyx from which it is easily recognized by the purple flowers, narrow tubular

calyx, short, fascicled inflorescences, shorter staminal tube, and longer bracts and stipules. Clitoria dendrina also has affinities with C. froesii, a liana with a longer calyx tube, larger flowers, longer ovaries and staminal tube, and larger anthers.

DISTRIBUTION (Figure 33): This species has a broad distribution in Venezuela and northern Colombia, with one collection from central Colombia. It inhabits dry forest in open areas, along forest borders, and savannas at elevations of 50-900 m. Steysmark & Espinaza 108815 noted that the plants were located below the cloud forest belt. Cowan & Wurdack 31538 noted the trees frequent on an igneous knob.

V E N E Z U E L A. AMAZONAS: ca 3 mi down Caño Asisa from Parú Savanna camp, 17 Feb 1951, Cowan & Wurdack 31538 (NY,US,VEN). BOLÍVAR: sabanas de Las Majadas, Puruey, 18 Jan 1948, Tamayo 3456 (VEN-2 sh.); cerro Negro Perón, on EW crystalline range on right bank of river, just below El Carmen, ca 50 river km from mouth, Río Paraguaza, 120-350 m, 27 Dec 1955, Wurdack & Monachino 40979 (GH,NY,U,VEN); just below Raudal Maraca, ca 110 river km from mouth, Río Paraguaza, 115 m, 29 Dec 1955, Wurdack & Monachino 41006 (F,NY,RB,US,VEN); Las Hicotas, Feb 1942, Tamayo 2192 (VEN); 9 km E de Túriba, Ho. Cedeño, 6-11 Dec 1970, Marciano-Berti 2553 (VEN); de la Prisión, Medico Caura, 120 m, 29 Mar 1939, Williams 11638 (F,US,VEN). ARAGUA: Maracay, 1928, Vogel 620 (M-2 sh.); N of Maraquay, 25 Feb 1941, Tamayo 1649 (US); Parque Nacional, 10 Feb 1946, Pittier 15222 (VEN); Choroní, 800 m, Smith 3270 (VEN); El Castaño, 400-600 m, 15 Mar 1940, Pittier 14278 (VEN). CARABOBO: fe [sic] mi S of Guique. 3000', Fendler 305 (S!=photo of K); between Valencia & Yuma, 500 m, 24 Dec 38, Alston 5660 (BM,NY); vic Valencia, 400-800 m, 8 Dec 1919, Pittier 8669 (GH,NY); Entrada, N de Valencia,



Nov 1941, Huguert 833 (R); l.c., 500 m, 20 Dec 1938, Alston 345 & Williams 10972 (Note: distributed under either number or both; BM,NY, S, VEN); l.c., 23 Dec 1891, Warmings 106 (US); vic. Las Trincheras, 200-400 m, 30 Dec 1917, Pittier 7632 (GH,US,VEN); l.c., 1891-2, Warmings 103 (US). COJODES: along road from camp de Carabobo to San Carlo, Feb 1933, Aristeguieta 1556 (VEN). LARA: between Paso de Angostura & Parque Nacional Yacambu, ca 7.5 km from Paso de Angostura, 900 m, 29 Dec 1973, Steyermark & Espinaza 108815 (FLAS-2 sh.!,VEN); El Ailar, 4 Dec 1967, Smith V1288 (VEN). PORTUGUESIA: vis Aqua Blanca, 5 Feb 48, Curran 267M (NY); road Acariqua-Ospino, Feb 1969, Aristeguieta & Zabala 6924 (VEN). BARINAS: road Guanore-Barinas, Feb 1953, Aristeguieta 1561 (VEN; Barina, 12 Feb 1957, Curran 28 (NY). MERIDA: Tovar, 1856-7, Fendler 305 (S! = photo of K).

C O L O M B I A. CESAR: Mirrea road, 1200', 7 Jan 1899, Smith 925 (type of synonym C. fendleri Rusby; flower: A,BM,E,F,G-2 sh.,GH, MICH,NY,PH,S,U); Masiga Viega, 800', March 1899, Smith 925 (type of synonym C. fendleri Rusby; fruit: NY). MAGDALENA: Poponte, Magdalena Valley, 150', 3 Jan 25, Allen 916 (K,MO); Minca region, 500-600 m, Espina & Giacometto A18 (F,NY). CORDOBA: Sahagun, 150-200 m, 27 Jan 1918, Pennell 40816 (NY). META: La Macarena, Río Guayabero, sabannas de Arenisca, 235-700 m, Feb-Mar 1959, Barringa & Mejia 17034 (NY) and 17141 (NY).

W E S T I N D I E S. 1786-91, von Rohr 62 (BM: locality unknown, cultivar?).

17. Clitoria froesii Fantz, sp. nov.

Liana. Branches 3-9 mm diameter, pith solid becoming hollow on large diameter branches, juvenile branches longitudinally striated, angular-terete, pubescence densely uncinata underneath erect to appressed macro-trichomes, branches becoming uncinata pubescent only, then glabrate; axillary buds 5 mm. Leaves 3-foliate, thick membranous, conspicuously pubescent, leaflets slightly asymmetrical, broad-ovate to broadly oval or broadly oblong, apex acuminate, acumen to 1.5 cm, base rotund, midrib and some of the primary nerves near the base weakly raised above, midrib densely pubescent, primary nerves of 9-11 pairs, upper surface dark green, pubescence minute, hirsute, texture similar to fine sandpaper, lower surface light green, pilose pubescent, nerves densely pilose-hirsute, lamina 10-25.5 cm long, 7-16.5 cm wide. Petioles elongated, 13-21 cm, subterete, pubescence dense, erect; rachis 4-6.5 cm. Petiolules 5-7 mm, quadrangular, pubescence dense, erect, tawny. Stipules caducous, lanceolate, acute, 4-7 mm long x 2 mm wide on juvenile branches and densely pubescent, to 10 mm x 3 mm when persistent, and glabrate; stipels caducous, linear, acute, weakly 3-nerved, 3-6 mm long, 0.5-1 mm wide, pubescence uncinata, ciliolate. Inflorescence axillary and terminal, racemose-nodose, axes solitary, occasionally branched near base, few-flowered, pubescence dense, minute, erect, 1.5-3 cm (observed mostly with buds). Pedicels 6-7 mm. Bracts minute, ovate, acute, densely pubescent, 2-3 mm long, 2 mm wide. Bracteoles minute, ovate, acute, densely pubescent, 3-4 mm long, 2 mm wide, inserted at calyx base. Flowers small, 3.5-4 cm, color unknown. Calyx pubescence dense, appressed, tube short, 12-13 mm long, 4-6 mm

wide at base to 7-9 mm at throat, lobes minute, deltoid, acute, (3) 4 mm long, 2 mm wide, ventral lobe subequal, 1-1.5 mm wide. Vexillum pubescence short, sericeous, blade ca 2.5 cm wide, claw 4-6 mm. Alae extended beyond carina by 4-6 mm, blade 18-21 mm long, 4-8 mm wide, claw short, 7-9 mm. Carina falcate, 9-13 mm long, 4 mm wide, claw 12-16 mm. Staminal tube diadelphous, vexillary stamen coherent below to near its middle, column clabrous, 24-26 mm long, free filaments 2-4 mm; anthers lanceolate, long-apiculate, 2.4-3 mm long, 0.5-0.8 mm wide. Gynophore 2-3 mm; ovary 10-11 mm long, 1.2-1.3 mm wide, pubescence dense, white; style 14-15 mm, geniculate 6 mm from distal end; stigma capitate, 0.5 mm diameter. Legume unknown. Figure 41.

Fróes' Clitoria is characterized as a liana with small flowers that have short calyx tubes and minute lobes.

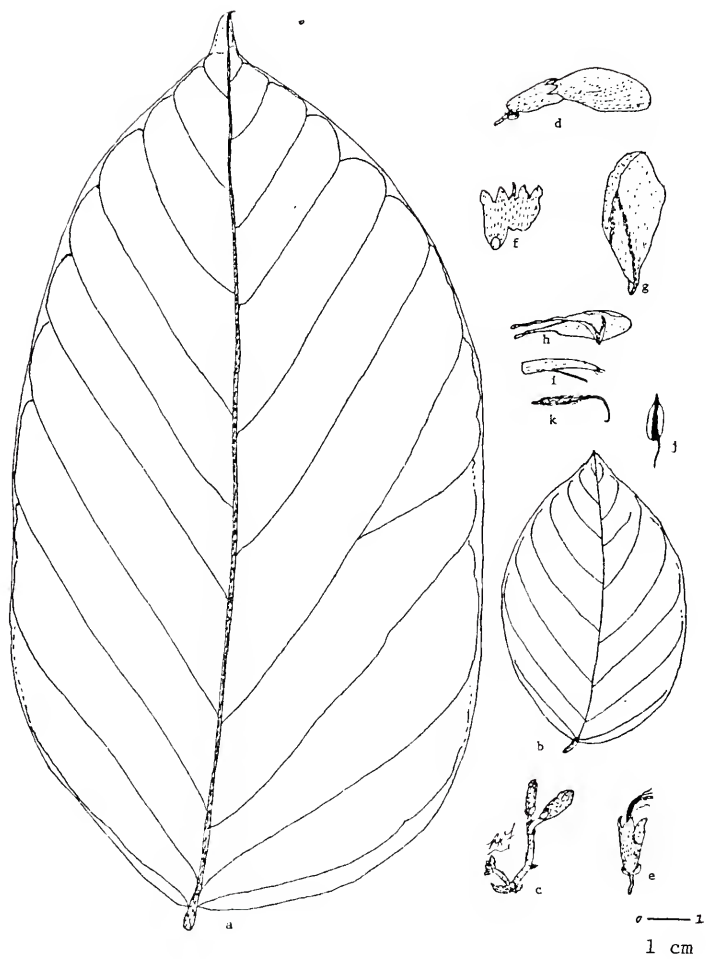
PHENOLOGY: The only known collection of flowers was made in January.

TYPE COLLECTION: BRAZIL. Amazonas: terra firma, Macubeta on Rio Maria, basin Rio Negro, 31 Jan 1942, Fróes 12441/185 (HOLOTYPE: NY, Krukoff Herb. placed in Britton's Herb. Isotype: A).

Of the two known collections, the type collection has flowers whereas the paratype is vegetative. The New York collection was selected as the holotype because it had inflorescences and a dissected flower in a paper towel packet (placed in cellophane envelope by this author). The Arnold Arboretum specimen had fewer flowers (one dissected) and lacked inflorescences. The New York specimen has immature leaves whereas the isotype has the larger leaves.

VERNACULAR NAMES: BRAZIL (AMAZONAS): Darume, Fróes 12441/185 & 12431/175.

Figure 41. Clitoria froesii. (a) mature leaflet, x 1; (b) juvenile leaflet appearing with inflorescence, x 1; (c) juvenile inflorescence, x 1; (d) flower, x 1; (e) calyx with persistent staminal tube, x 1; (f) calyx and bracteole, x 1; (g) vexillum x 1; (h) ala and carina, x 1; (i) androecium, x 1; (j) anther, x 4; (k) gynoecium, x 1. (Froes 1244i/185, A: a,d,f,h,j; NY: b-c,e,g,i,k.)



ECONOMIC IMPORTANCE: Darume vine is considered the most toxic plant in the region of the Rio Içana. It is planted by the Indians and found in fair quantities, according to Fróes 12441/185. Fróes does not indicate for what purpose the toxin is used by the Indians, but this author assumes that the toxin is used as a fish poison, similar to C. arborescens.

NOTES: The Darume vine does not fit in the known species. Its nearest relative is probably C. dendrina which differs by its arboreal habit, smaller calyx, pubescence on the lower leaf surface, smaller anthers, smaller pedicels, more crowded inflorescences, and general leaf shape. Although the Darume vine is the only liana in the section Brachycalyx, which is characteristically comprised of tall erect shrubs to trees, the short calyx and minute lobes plus the pubescence on the upper leaf surface suggest that this species belongs more naturally in section Brachycalyx than in section Auliflorae, which is characteristically comprised of lianas.

DISTRIBUTION (Figure 33): This species has been poorly collected and is known only from the Rio Negro basin of Brazil, where it is cultivated by the Indians.

B R A Z I L. AMAZONAS: Pirapua on Rio Negro, 1941, Fróes 12431/175 (Paratype: S, Erik Wall Herb.).

Section Cauliflorae

ID. Clitoria L. subgenus Bractearia (Mart. ex Benth.) Fantz  
 section Cauliflorae Fantz, sect. nov.

Lianas or occasionally an erect shrub. Inflorescence typically cauliflorous and axillary, racemose, more or less nodose, Bracteoles variable in size, but not large and hiding the calyx, typically shorter than the calyx tube and narrow, 1-3 (6) mm wide. Calyx tube bearing conspicuous lobes, typically 4-13 (27) mm long. Legume flat to weakly depressed between the seeds, pubescence typically uncinata with sparse spreading to suberect trichomes, occasionally densely appressed with uncinata trichomes lacking. Seeds usually suborbicular to slightly longer than wide or slightly wider than long, rarely oblong, usually thickened, 3-5 mm thick, occasionally compressed.

The members of the section Cauliflorae consist of a heterogenous group of species that do not fit in the sections Bractearia, Flexuosa, or Brachycalyx. As a result, they are more difficult to characterize. However, members of section Cauliflorae can be recognized easily by the climbing habit, the cauliflorous inflorescence (when produced), thickened seeds, and the lack of the key characteristics of the other three sections. This includes the lack of the conspicuously large bracteoles which hide the calyx (characteristic of sections Bractearia and Flexuosa) and the minute calyx lobes of 1-4 mm and submentaceous fruits (characteristic of section Brachycalyx). A liana with narrow bracteoles (1-6 mm wide) and conspicuous calyx teeth plus cauliflorous inflorescences should indicate a member of the section Cauliflorae.

HOLOTYPE SPECIES: C. sagotii Fantz

NOTES: With a heterogenous assemblage of species, the choice of a type species was difficult. Clitoria sagotii has more of the common characteristics (i.e. those characteristics found in a large number of the species) as discussed below. Clitoria javitensis was considered as the type because of its large degree of variability in the species, but this species has some characteristics (i.e. fruits) that suggest affinities with members of section Brachycalyx.

Two species, both endemics, stand out immediately as distinct and representing a divergent evolutionary line. Clitoria obidensis and C. plumosa are both conspicuously hairy with long shaggy hairs, often rufescent, occurring on the major axes of the plant, the calyx, and both leaf surfaces. In addition, the calyx lobes and bracteoles are extremely long compared to other members of this section. The anthers are also large (2-3 mm x 0.7-1 mm), which is found only in one other species, C. pendens. The similarity of the fruits of C. obidensis (absent in C. plumosa), the calyx tube, and the androecium and gynoecium, plus the cauliflorous inflorescences, indicate that it is more natural to include them within the section Cauliflorae than in a section of their own.

Clitoria coriacea is distinct with its ceriferous leaves, oblong seeds in which the length is much longer than the width, and its shorter fruits. The species has a shrub habit, apparently non-climbing. The inflorescences are borne at defoliated nodes as in section Brachycalyx. Yet this species has the conspicuous calyx lobes (7-12 mm), non-submentaceous fruits, and typical uncinat pubescence of the calyx and fruits, as found in most members of section Cauliflorae. Despite



the aberrant characteristics, this species appears to fit better in section Cauliflorae than in section Brachycalyx, or in a section of its own.

The remaining species are very similar in many ways, so much so that historically, they have often been misidentified. Three names are commonly used for this group of species. First, any liana with an elongated inflorescence was given the name C. leptostachya. This name has also been applied in some instances to specimens with longer inflorescences and the distinctly large bracteoles which hide the calyx. Most of the time it has been applied to plants from Guyana, Surinam, and adjacent areas. Two distinct species are involved. Second, a name commonly used for lianas was C. arborescens, the earliest name applied for any woody climber that lacked the large primitive bracteoles. Thus C. arborescens has been misapplied to many early collections of woody vines. A third name applied was C. javitensis. This name became more popular for lianas when some botanists pointed out that C. arborescens had tomentose pubescence on the lower leaf surface, whereas C. javitensis had appressed hairs. A number of specimens of the eastern section of northern South America possessed glabrous leaves. These were included as a separate variety of C. javitensis. This broad concept of C. javitensis has been abandoned in this treatment. Several distinct species are involved.

Variation of several characters plus misidentified specimens has accounted for much of the nomenclatural confusion. A synopsis of the variable traits is useful. Within this group, inconspicuous uncinat trichomes are typically found on the fruits, calices, ovaries, and often on the axes and branchlets of the inflorescence. Specimens matching the

type of C. javitensis lack this anatomical character. The macro-trochomes of C. javitensis are appressed on the calyx, lower leaf surface, and are densely exhibited on the fruits. The glabrous "variety" typically lacked these trichomes or possessed scattered, subappressed to suberect trichomes. Inflorescences showed much variation. Some specimens have inflorescences which are conspicuously short, subsessile to 0.5 cm long, and are few-flowered. Others had longer inflorescences of 1-6 cm, or occasionally longer to ca 16 cm and bore several flowers. Bracteole length was very variable, but they are usually narrow. Most bracteoles are much shorter than the calyx, although longer bracteoles occurred. Calyx tubes and lobes are very variable in length, with most members exhibiting tubes of 10-24 mm long and lobes of 4-11 (13) mm in length. Ovary sizes are quite variable, from 10-22 mm. The sericeous hairs are white, white with a yellow tinge, or tawny-rufescent; or they are often lacking and then the pubescence is conspicuously densely uncinata. Staminal tubes range from 24-49 mm long. The midrib of the upper surface of the leaves is weakly to strongly raised in some members. Flower sizes and floral parts are variable, especially in the length of the claws, which is a good indicator character.

The key to the species of section Cauliflorae is constructed such that those species which have been typically included as one species or those species which have been frequently confused with each other, are placed adjacent to each other. Couplet two provides less contrast than desired, but the calyx pubescence is a reliable clue to a similar pubescence on the fruit and ovary. Clitoria cavalcantei is an exception by having an appressed pubescent calyx which lacks the uncinata trichomes but which has the uncinata trichomes conspicuously observed

on the ovary and legume. Inflorescence length may be questionable, but C. selloi is geographically isolated from the combined distribution of the other species. Clitoria selloi is found near the eastern coast of Brazil, in the state of Bahia south of Rio de Janeiro. Other species are distributed in the central and western part of the Amazon Basin northward. Legume length and seed thickness appear very reliable for those species in which the fruits are known, but often collections are made which lack the fruits. Style length compared to ovary length proved reliable, but this often required some dissection of the flower. By providing a number of characteristics and noting the exceptions that occur, this key was superior for distinguishing different types of collections than a more artificial key of one to a few characters.

#### KEY TO THE SPECIES:

1. Bracteoles short, 2-15 mm; leaves glabrous above (excluding occasional pubescence on midrib); calyx lobes 4-13 mm; calyx tube 10-24 mm.
2. Style length subequalling the ovary length; legume long, 16-23 cm, and broader, 18-25 mm wide; seeds compressed, 2-3 mm thick; calyx pubescence (vidi 20 x) conspicuously appressed, moderate to dense, uncinete hairs hidden (C. arborescens) to lacking; inflorescence typically medium-sized, 1-15 (20) cm.
3. Bracteoles 10-15 mm long; calyx tube 12-17 mm; leaf pubescence tomentose below; ovary 15-18 mm; style 16-19 mm; staminal tube 28-35 mm; flowers 4-6 cm; vexillum claw 8-12 mm; stipe 14-20 mm; legume pubescence uncinete plus a few scattered, suberect trichomes (northern South America, Guyana to Colombia) . . . . . 18. C. arborescens

3. Bracteoles 2-7 mm; calyx tube 17-24 mm; leaf pubescence below appressed to glabrate to glabrous, infrequently pilose; ovary 18-22 mm; style 17-25 mm; staminal tube 36-49 mm; flowers (5.5) 6-8 cm; vexillum claw 15-19 mm; stipe 24-33 mm; legume pubescence dense, rufus, appressed to suberect (northwestern South America and Central America, Venezuela to Peru plus mainly Panama). . 19. C. javitensis
2. Style much longer than the ovary, typically 10 mm or more (only 3-6 mm longer in C. selloi and C. leptostachya); legume smaller, (6) 8-16 (18) cm long, 10-18 (20) mm wide; seeds thickened, 3-5 mm thick; calyx pubescence (vidi 20x) conspicuously uncinat plus some subappressed to suberect hairs, moderate to scattered (appressed with uncinat hairs lacking in C. cavalcantei); inflorescence very short (sessile to 1.5 cm) or very elongated, 10-90 cm (medium-sized, 2-15 cm in C. selloi).
4. Flowers 4-8 cm; staminal tube 32-49 mm; carina blade 11-20 mm long, claw 23-36 mm; style 17-33 mm, much exceeding ovary (except C. leptostachya); inflorescence very short (sessile to 1.5 cm) or very elongate (10-90 cm); plant of Amazon Basin northward.
5. Bracteoles elongate, 5-15 mm long, width 1-3 (5) mm; inflorescence very short, sessile to 1.5 cm, few-flowered.
6. Calyx pubescence appressed, uncinat hairs lacking; style 28-32 mm; vexillum claw 14-18 mm; inflorescence 0.5-1.5 cm; calyx tube 16-20 mm, lobes 5-7 mm (Para, Brazil) . . . . . 20. C. cavalcantei

6. Calyx pubescence uncinata with scattered subappressed to suberect hairs; style 21-27 mm; vexillum claw 6-10 mm; inflorescence subsessile, to 0.5 cm; calyx tube 11-17 (18) mm, lobes (5-7) 7-13 mm (those with shorter lobes have tubes 11-15 mm; those whose tubes 14-18 mm have lobes 7-13 mm).
7. Stipules 3-6 mm; bracts 2-5 mm; bracteoles 1-3 mm wide; staminal tube 32-39 mm.
8. Leaves pubescent below, margin weakly to strongly revolute, primary nerves of 6-8 pair; leaflets smaller, 2-5 (6) cm wide, 5-10 (13) cm long; flowers 4-6 cm; stipe 16-20 mm.
9. Bracteoles 5-8 (11) mm; vexillum claw 9-10 mm; staminal tube 32-39 mm; leaf appressed pubescent below, ceriferous, margin strongly revolute, midrib impressed above; shrub (Venezuela) . . . . . 21. C. coriacea
9. Bracteoles 13-14 mm; vexillum claw 6 mm; staminal tube 28 mm; leaf tomentose below, non-ceriferous, margin weakly revolute, midrib weakly raised above (Brazil) . . . . 22. C. tunuhiensis
8. Leaves glabrous below, margin non-revolute, primary nerves of 8-12 pair; leaflets large, 5-9 cm wide, 8-20 cm long; flowers (5)

- 6-8 cm; stipe 27-35 mm (French Guiana to Venezuela plus adjacent Brazil) . . . . .  
 . . . . . 23. C. sagotii
7. Stipules 8-19 mm; bracts 5-8 mm; bracteoles 3-5 mm wide; staminal tube 39-43 mm (Guyana) . . . . .  
 . . . . . 24. C. kaieteurensis
5. Bracteoles short, 1.5-4 mm long, 0.8-1.2 mm wide; inflorescence very elongated, 10-90 cm, multiflowered.
10. Flowers 6-8 cm; staminal tube 40-48 mm; ovary 18-20 mm; style 27-33 mm; bracteoles 3-5 mm; calyx tube broad, 9-15 mm wide at throat, lobes 6-9 mm Suriname, eastern Guyana) . . . 25. C. pendens
10. Flowers 4-6 cm; staminal tube 32-37 mm; ovary 12-15 mm; style 17-19 mm; bracteoles 2 (3) mm; calyx tube narrow, 7-10 mm wide at throat, lobes 4-6 mm (Guyana, Brazil) . . . 26. C. leptostachya
4. Flowers small, 2-4 (4.5) cm; staminal tube 24-28 mm; carina blade 8-10 mm, claw 18-20 mm; style 13-16 mm, slightly exceeding the ovary length; inflorescence medium-length, 3-15 cm; plant of eastern Brazil (Bahia to Rio de Janeiro) . . . . . 27. C. selloi
1. Bracteoles extremely long, 20-35 mm; leaves densely pubescent above; calyx lobes 13-27 mm; calyx tube 20-30 mm.
11. Stipules 6-11 mm; inflorescence short, to 1 cm; bracts 6-11 mm; bracteoles 4-6 mm wide; calyx lobes 20-27 mm, subequaling tube length of 20-27 mm; ovary 13-17 mm; ala claw 18-20 mm; carina claw 31-33 mm (Brazil) . . . . . 28. C. obidensis

11. Stipules 19-29 mm; inflorescence elongated, 10-15 cm; bracts 13-16 mm; bracteoles 3-4 mm wide; calyx lobes 13-18 mm, nearly half the tube length of 27-30 mm; ovary 21-22 mm; alae claw 23-25 mm; carina claw 34-38 mm (Colombia) . . 29. C. plumosa

DISTRIBUTION (Figure 10): The members of section Cauliflorae are distributed mainly in the central and western Amazon Basin northward, and in Panama. One species, C. selloi, is found outside this range, along the eastern coastal forests of Brazil, from Bahia to Rio de Janeiro. A second species, C. javitensis, has been collected infrequently in countries of Central America north of Panama.

18. Clitoria arborescens R. Brown, in Aiton Hort. Kew, ed. 2, 4: 302. 1814. (= C. arborescens Ait., l.c., err. cit. pro )

Clitoria poiteai DC., Prod. 2: 234. 1825. (C. poiteai DC., orthogr. pro ; C. poiteai Dec., Steudel Nom. Bot. ed. 2, 1: 386. 1841, err. cit. pro; C. poiteai Benth., Ann. Wein. Mus. Nat. 2: 115. 1837, err. cit. pro ).

Clitoria amoena Miquel, Nat. Verh. Holl. Mat. Wet. Haarl. 7: 24. 1851.

Ternatea arborescens (Ait.) Kuntze, Riv. Gen. Pl. 1: 210. 1891.

Scandent scrub, typically tall climbing liana, or an erect shrub with climbing branches, or infrequently an erect shrub to 5 m tall and 8 cm diameter. Branches 2-8 mm thick, pith hollow, juvenile branches compressed-quadrangular, becoming nearly terete, longitudinally striate, pubescence of uncinata and rufus, densely appressed hairs, trichomes

becoming whitish, the appressed hairs becoming less dense and the uncinat hairs more conspicuous; bark grayish-brown, splitting in longitudinal strips; axillary buds 3-4 mm. Leaves 3-foliate, subcoriaceous, leaflets basically elliptic, becoming oblong-elliptic, obovate, oval to suborbicular, apex broadly acute to obtuse, more or less mucronate, base broad cuneate to rotund, rarely retuse, margin thick-veined, midrib impressed above, primary nerves of 9-14 pair, upper surface dark green, glabrous, juvenile leaflets with minute hairs along midrib, lower surface green, tomentose, trichomes rufus, whitened with age, less dense, lamina (5) 8-15 (21) cm long, 3-9 (13) cm wide. Petiole compressed-quadrangular to subterete, weakly caniculate adaxially, weakly twisting, 4-15 (19.5) cm; pubescence of conspicuous, rufus, appressed to suberect hairs with scattered, inconspicuous uncinat trichomes; rachis 1-2.5 (3) cm. Petiolules subquadrangular, 4-9 mm, pubescence dense, rufus, spreading. Stipules deltoid to deltoid-lanceolate, semipersistent, acute, 6-9 mm long, 3-6 mm wide at base, pubescence uncinat and appressed, rufus; stipels linear, acute, pubescence as stipules, 4-8 mm long, 1-2 mm wide. Inflorescences axillary, racemose, nodose, multiflowered, crowded in bud, lower flowers aborting as axis elongates, axes subquadrangular, laterally compressed, 5-16 (22) cm long, 2-6 mm thick, pubescence of uncinat and densely appressed, rufus hairs. Pedicels 4-9 mm, becoming 3-4 mm thick in fruit. Peduncle 1.5-4.5 cm, straight; rachis very weakly flexuous, internodes 4-10 (15) mm. Bracts persistent, often spreading to reflexed with age after flower aborts, lanceolate, acuminate, 5-9 mm long, 1.5-2 (3) mm wide, pubescence uncinat and appressed, rufus, appressed, outer bract slightly shorter than middle pair, inner bracts caducous.



Bracteoles lanceolate to linear, acuminate, often spreading, more or less slightly twisted, almost subequal the calyx tube, (8) 10-15 mm long, 2-3 (4) mm wide, inserted 1.5-2 mm below the calyx base, pubescence uncinata and appressed, rufus. Flowers medium-sized, 4-5.5 (6) cm, bicolored, blue to violet and/or white; vexillum with a white to pale violet center, reddish to purplish veined, blue to violet toward margins; ala and carina white or white with violet tinge, veins light purple. Calyx yellowish-green, often longitudinally furrowed, veins inconspicuous, pubescence inconspicuously uncinata beneath moderate to densely, appressed, rufus trichomes, tube 12-17 mm long, 4-7 mm wide at base to 7-11 mm wide at the throat, lobes deltoid, acuminate-subulate, 5-8 mm long, 2-3 mm wide at base, ventral lobe linear to subulate, 6-11 mm. Vexillum pubescence moderate to dense, rufus, appressed, blade 2.5-3.5 cm wide, claw 8-12 mm. Alae extended beyond the carina 5-8 mm, blade 18-25 mm long, 5-10 mm wide, with scattered uncinata pubescence, claw 14-18 mm. Carina falcate, blade 9-13 mm long, 4-5 mm wide, claw 23-27 mm. Staminal tube with uncinata pubescence near apex, 28-35 mm, free filaments 2-4 mm long, with moderate to densely uncinata pubescence; anthers lanceolate, 1.5-2 mm long, 0.6-0.8 mm wide. Gynophore 1-3 mm; pubescence densely appressed, rufus; ovary 15-18 mm long, 1-1.5 mm wide, pubescence rufus, sericeous; style 16-19 mm, geniculate 5-7 mm from distal end; stigma subcapitate, ca 0.5 mm diameter. Legume short-stipitate, shortly exceeding to slightly included within the calyx, brown, flat, pubescence of uncinata with scattered suberect trichomes, valves 16-23 cm long (rarely with matured fruit 5.5-13 cm), 18-26 mm wide; stipe brown, 2-3 mm thick expanding to near 6 mm at apex, 14-20 mm long, pubescence uncinata with sparse

scattered trichomes; beak when present, to 6 mm; dehiscence causing valve to twist one-half of a turn. Seeds black, smooth, lenticular, face suborbicular to slightly longer than wide, base truncate to slightly oblique, 11-13 mm long, 10-13 mm wide, typically 7-11 seeds per pod; hilum oblong, 2 mm x 1 mm. Figure 42.

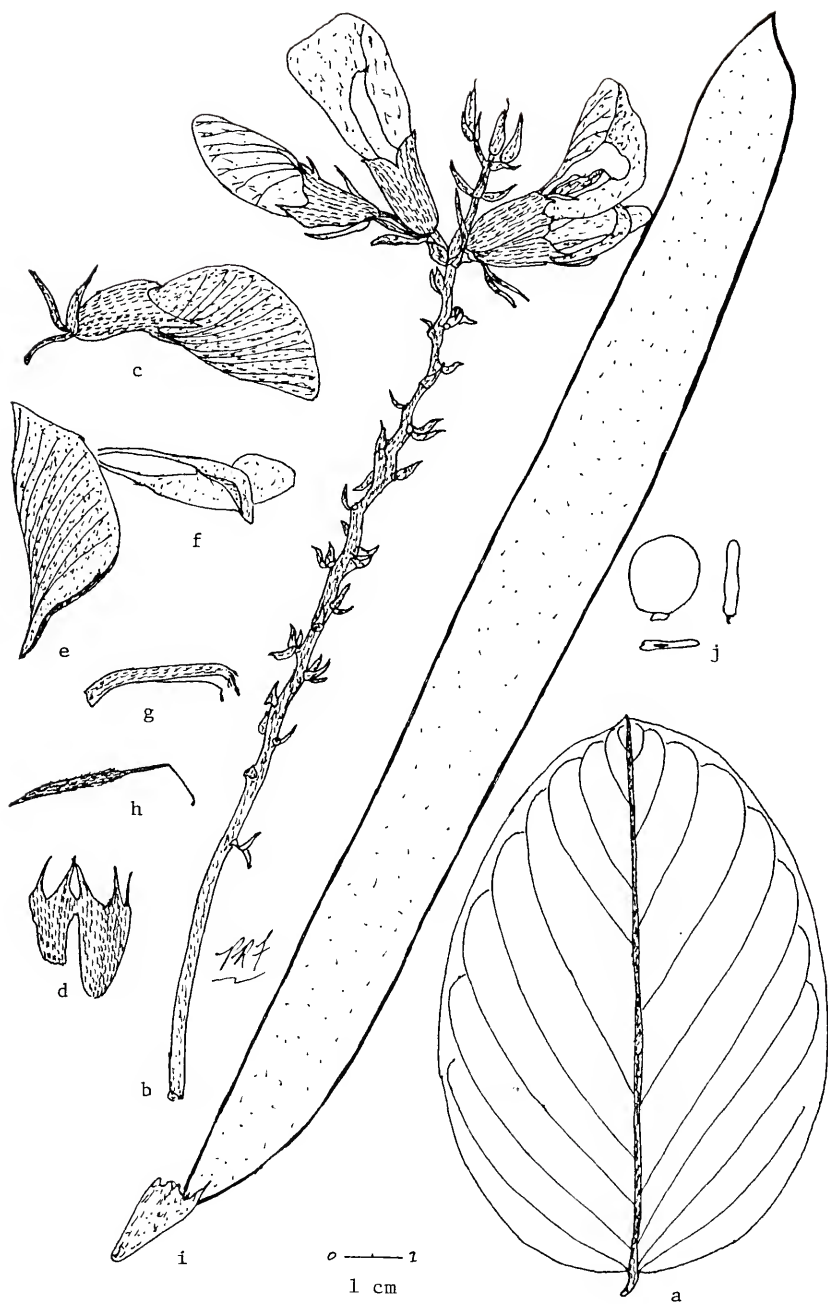
The Arborescent Clitoria is characterized as a scandent shrub with elongate inflorescences bearing medium-sized flowers subtended by narrow bracteoles that subequal the calyx tube, or bearing long fruits with an uncinat pubescence, and with leaves that are tomentose below. The tomentose leaves and long bracteoles are good indicators of this species.

PHENOLOGY: Flowers are generally collected from July to early December, although single collections were made in January, February, and May. In Venezuela, a few collections were made in April. Fruits have been collected from July to December, with most maturing from September to November. Despite the similarity in flowering and fruiting season, individual collections usually bear only fruits or the flowers.

TYPE COLLECTION: Cult. from Trinidad, 1804, James Vere s.n.  
(LECTOTYPE: BM).

This species generally goes by the name C. arborescens Ait. in the literature. Stafleau (1967, p. 4) reported that Aiton was the editor of Hortus Kewensis, edition two, and that most of the new descriptions were written by other contributing authors. Stafleau credits R. Brown for classes XIII to Cryptogamie, which included class XVII (Diadelphia) where the genus Clitoria was placed. Therefore, the correct citation for the species should be C. arborescens R. Brown in Ait.

Figure 42. Clitoria arborescens. (a) leaflet, x 1; (b) inflorescence, x 1; (c) flower, x 1; (d) calyx, x 1; (e) vexillum, x 1; (f) ala and carina, x 1; (g) androecium, x 1; (h) gynoecium, x 1; (i) legume x 1; (j) three views of seed, x 1.  
(Mélinon 51, NY: a,i. Mélinon 347, BM: b. Perrottet s.n., G-279-80: c-h. Williams 12557, F 1084942: j.)



R. Brown cited type specimens when he published the name C. arborescens. The type syntypes were "Alexander Anderson and James Vere (cult. 1804)." The scant data given for the types plus a description that is very generalized, such that it could fit most members of subgenus Bractearia, make it difficult to characterize Brown's species. However, this species has been cultivated, and more information can be obtained from later publications. In 1832, the "Curtis Botanical Magazine" published a description of the species along with an illustration. However, problems of identification persist. John Curtis made an illustration of the flowering specimen in 1822. Ten years later, S. Curtis reported that he added a leaf and the dissected flower parts. The leaf appears to represent C. javitensis based upon its long acuminate apex, wider-spaced and fewer primary nerves, along with the leaf description of the pubescence agreeing with C. javitensis, not C. arborescens. The stamens were noted as glabrous, whereas in C. arborescens, the filaments are densely uncinat pubescent. The rest of the description is so general that it could fit either species, although the flower color agrees with C. arborescens more than C. javitensis.

In 1825, de Candolle published a detailed description of a new species, C. poitaei (Type: Poiteau s.n., Guiana Gallica). In 1851, Miquel published C. amoena (Type: Kappler 1933). In his synopsis of the genus Clitoria, Bentham (1858) described C. arborescens Ait. and included the names C. poitaei DC. and C. amoena Miq. in synonymy. Bentham cited several collections, including "Anderson (Br. Guiana), Hostmann 50 & 1097, Kappler 1933, Perrottet (Fr. Guiana), Schomburgk 849, Rich. Schomburgk 1331, Lockhart, & Guilding (St. Vincent)." This author

has seen specimens representing all these collections, except the last two. They are all of the same species.

Of the two syntypes, the Anderson collection appears to be the better selection for the lectotype, since it was cited by both Brown and Bentham. But it is uncertain that they examine the same Anderson collection. Brown noted the plant from Trinidad. The specimen in the Bentham herbarium (K-417!) bears the label data "frutex elegans, flore odorato, St. Vincent's, Anderson" on the printed label titled "hb. Forsyth. 1835." The term "St. Vincent's" was crossed out by a line drawn through it and "Guiana" inked in above it. This may or may not be the specimen, or a duplicate of the specimen, that Brown referred to in his publication.

The Vere collection was not cited by Bentham, but it is a more probable syntype or isosyntype. This specimen is placed in a type folder marked "C. arborea" and bears the data "horti, from Ins. Trinitatis, Dr. Vere" (BM!). At the bottom of the sheet, in faint pencil lead, are the words "Clitoria arbores Hort. Kew no. 2." This specimen is not the type of C. arborea Benth. (1837) whose name was not published in the "Hortus Kewensis." Nor has the Vere specimen ever been cited for that species. The only species published in "Hortus Kewensis" was C. arborescens. The incomplete identification on the Vere collection misled the individual who placed the sheet in an individual folder and marked it "C. arborea." This Vere specimen is probably from an individual plant growing in his garden, and the plant referred to by Curtis (1832) who indicated that a cultivated stock of the species (Curtis was discussing C. arborescens) was introduced to Mr. Vere's garden from Trinidad in the year 1804. Brown probably

examined this specimen or at least based his description in part on the plant in Dr. Vere's garden which this specimen represents. Since the Vere collection was the more probable type collection of the two possible syntype collections, it is selected as the lectotype.

The lectotype is not as representative a collection as the Anderson or type collections of the synonyms. The leaf pubescence is reduced and is located mostly along the veins, the pubescence common for the older leaves. The bracteoles are slightly shorter than the typical range of variation (10-15 mm).

The name C. poitaei was published by de Candolle (1825) based upon a collection of Poiteau from French Guiana. The collection labeled "Cayenne, Guyane, Jul 1824, Poiteau s.n., hb. Gay" (GH! K-30!) is the probable type. These specimens agree with the Anderson and Vere collections. Bentham was correct in synonymizing the name C. poitaei DC. with C. arborescens R. Brown in Ait. A. P. de Candolle based his specific epithet on Poiteau's name, but altered the spelling (intentionally?) to C. poitaei. A. P. de Candolle made corrections in his "Addenda et Corrigenda," but he did not correct C. poitaei to C. poiteui.

Miquel published the name C. amoena in 1851 citing one collection, Kappler 1933 (G-281! M 14681! S! U 37642A! W 88619!). Only the Utrecht specimen was identified as C. amoena, whereas all others were identified as C. poitaei DC. The Utrecht specimen is the more probable type and the other specimens are duplicates of the type.

One additional nomenclatural note. Bentham (1858) cited two additional collections for C. arborescens in addition to those listed above. Cuming 1142 and Sinclair, both of Panama, represent

misidentifications of a pilose form of C. javitensis. Clitoria arborescens has been applied historically to two Panamanian species, one a tree (= C. glaberrima) and the other a liana (C. javitensis). Clitoria arborescens may have been applied to the Panamanian species because of the early misidentification of these two collections. The names for these Panamanian specimens were recently corrected by Croat (1974).

VERNACULAR NAMES: SURINAME: Haiariballi (Arawak), Archer 2854. (MAROWIJNE): Kroemenoeroe (Car.), Lanjouw & Linderman 990. (NICKERIE): Koeroemoe enoelae (Kar.), Stinkvogel-oogen, Kav-ai, (N.E.), Gonggryp 2179. (SARAMACCA): Kourai (bigie nonloe), Pulle 222.

ECONOMIC IMPORTANCE: This species has been cultivated in the past, introduced into Trinidad, St. Vincent, and botanical gardens in England. Archer 2547 (Guyana) noted the plant was used as a fish poison.

NOTES: Clitoria arborescens has close affinities with C. javitensis. Both species have larger fruits, appressed pubescent calices, and styles subequalling the ovary length, unlike other species which have smaller fruits, uncinatate pubescent calices, and styles longer than the ovaries. Clitoria arborescens can be distinguished easily from C. javitensis by the presence of uncinatate hairs on the calyx and legume, smaller flowers, and shorter reproductive structures (ovary, style, staminal tube), and conspicuously longer bracteoles.

The leaves are variable within the species. Suborbicular leaflets appear quite different from the elongated elliptic leaflets. But a series of intermediates from the basic elliptic leaflet can be observed, often within the same collection. Two collections, Maguire 24866 and



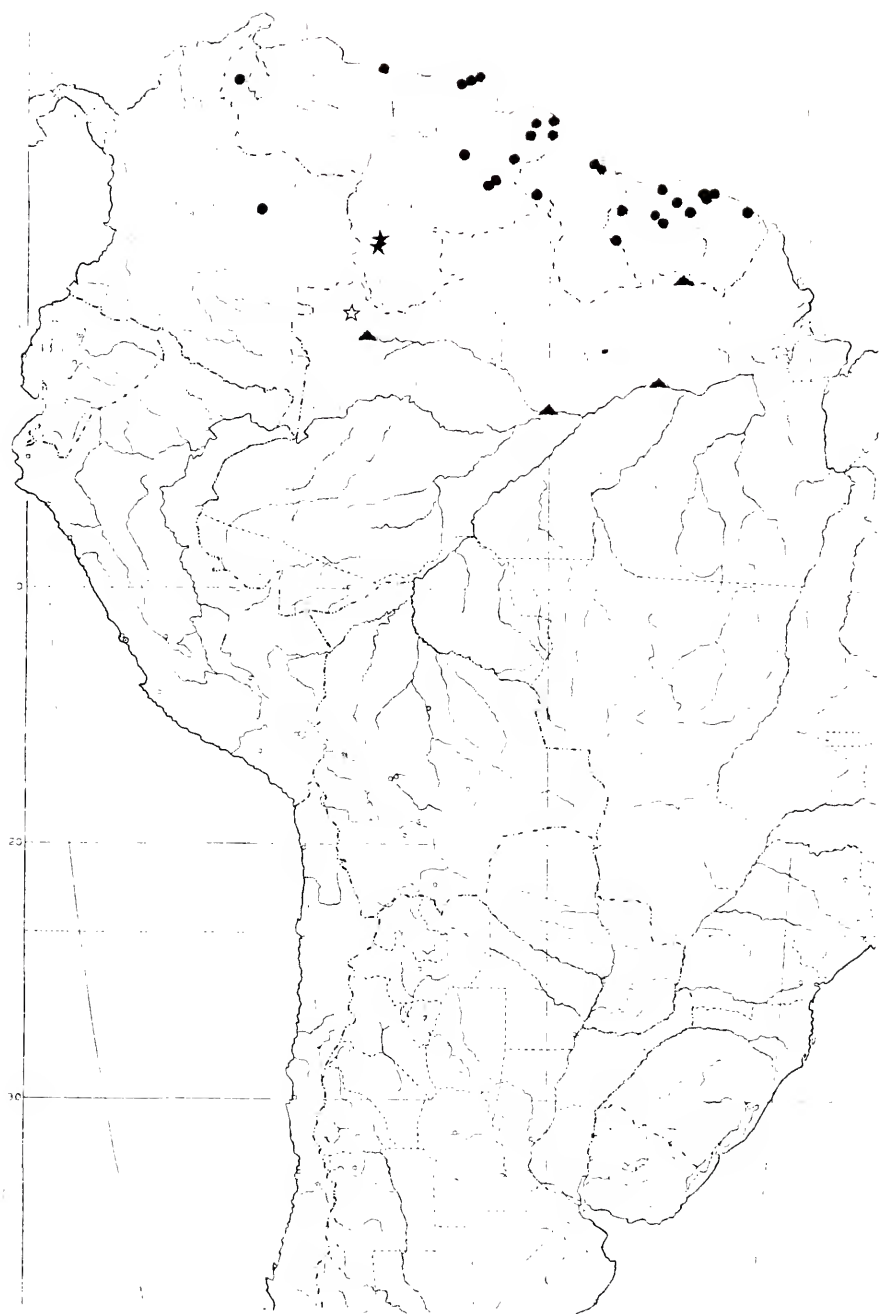
Jenman 361 were reported as trees, although otherwise they agree with other collections labeled as lianas or vines.

DISTRIBUTION (Figure 43): This species is distributed in northern South America, from French Guiana to eastern Venezuela, with isolated collections from Colombia and northern Venezuela. The species is not known from Panama nor other Central America countries, although it has been reported there in the literature. The erroneous reports were based upon misidentified collections. Plants are typically found in open forest areas or along the forest margins of a river bank. This species has been collected in gallery forests and reported from walaba forests, mora forests, and palm scrubs. Soil is generally reported as lateritic or sandy. Several Suriname collections note its occurrence with granite or volcanic slabs. The species has been collected at elevations of 65-420 m, although most collectors did not record the altitude.

F R E N C H G U I A N A. 1820, Perrottet s.n. (G-2 sh.). GUYANE: Cayenne, Anonymous s.n. (W 216971); l.c., Jul 1824, Poiteau s.n. (type of synonym C. poitaei: GH, K-30); Mana, 1854, Mélinon 51 (F,GH,NY) and 154 OE; l.c., 1855, Sagot 754 (BM,BR,W); St. Laurent, Stat. Crique Balatie, 22 Nov 1948, Bena 4338 (U,VEN); Maronia R., 1861, Mélinon 51 (BM); l.c., 1876, Mélinon 347 (BM).

S U R I N A M. Anonymous s.n. (M 12774); Kappler 90 (S); 1842-3, Hostmann 1097 (BM); Tigri-heddeval in Tanjimana R., Mennega 437 (U-2 sh.); Scotelweg, 2 & 12 Nov 1934, Archer 2854 (U). MAROWIJNE: ad flum. Marowyne, Jul 1846, Kappler 1933 (type of synonym C. amoena: G-281, M 14681, S,U 37642A,W 88619); Marowijne River near Armina Falls, 12 Aug 1933, Lanjouw 527 (U); fluv. Marowijne N of Albina, 18 Sep 1948, Lanjouw & Linderman 285 (NY,U); l.c., 1 Sep 1948, Lanjouw & Linderman

Figure 43. South American distribution of four species of section  
Cauliflorae. Clitoria cavalcantei (▲); C. coriacea (★);  
C. arborescens (●); C. tunuhiensis (☆).



990 (NY,U); fluv. Marowyne prope Albina, Jul 1904, Versteeg 532 (U); fluv. Marowyne prope Galibi, 15 Oct 1901, Went 421 (U-2 sh.). SURINAME: fluv. Suriname, 8 Jul 1900, Tresling 57 (U); Kabel station, 30 Aug 1914, Stahel 418 (MO,U); Groningen station, 10 May 1916, Samuels 170 (NY). SARAMACCA: Raleigh Falls, Coppename River alongside granite sheet of Voltzberg, 4 Dec 1956, Linderman 7753 (U,US); Coppename River near Raleigh Falls, 10 Dec 1933, Lanjouw 735 (U); fluv. Coppename prope mont Voltzberg, 23 Aug 1920, Pulle 286 (U); Coppename, Raleighvallen, 31 Jul 1923, Gonggryp & Stahel 6349 (U-2 sh.); l.c., Kelk road, 25 Sep 1954, Mennega 142 (U); 8 km Saramacca R., 29 Sep 1944, Maguire 24866 (F,GH, NY,RB-2 sh.,U,US); Saramacca R. between Posoegronoe & Grasi Falls, 11 Oct 1944, Maguire 24936 (F,NY,U-2 sh.,US); Paramaribo, 1910, Pulle 222 (U); l.c., Wullschlägel 88 (W). NICKERIE: around Kabalebo airstrip, 9 Jan 1965, Florschütz & Mass 2669 (U-2 sh.); Fluv. Corantyn, Kaboerikreek, 27 Jun 1916, Gonggryp 2179 (U); second hill, fluv. Corantijn, 7 Sep 1920, Pulle 467 (U); Corantijn, 1 dag stroompo v. rred. Hendri-vallen, 31 Aug 1935, Rombouts 163 (U); Akwansa, fl. Nickerie, 25 Sep 1916, Stahel & Gonggryp 3562 (U).

G U Y A N A (BR. GUIANA). Anderson s.n. (probable syntype, K-417); Jenman 2157 (NY-2 sh.); 1837, D. Schomburgk 2:82 (BM); 1837, R. Schomburgk 825 (K); Penal Settlement, 14 Dec 1919, Hitchcock 17239 (GH). BERBICE: Corentyne River, Greale, Oct 1879, Jenman 361 (K,NY); Governor Falls, Corentyne R., Sep, Forest Dept. Br. Guiana 6487 (NY); Powis ck., I.R. upper Courantyne River, 6 Nov 51, Forest Dept. Br. Guiana 6776 (MICH,NY). DEMERARA: envoi des Demerara, 1824, Parker s.n. (G). ESSEQUIBO: Warina Sub. Exp. Stat., Koriabo River, 16 Sep 1934, Archer 2537 (F,US); Mabaruma Hill, 18 Sep 1934, Archer 2547 (US);

Mazaruni Station, 27 Sep 1937, Sandwith 1604 (U); l.c., 22 Dec 1937, Forest Dept. Br. Guiana 2583 (NY); Parika, 18 mi W of Georgetown on Essequibo River, 19 Nov 1919, Hitchcock 16797 (GH,NY,S) and 16805 (GH, NY,S); Roraima, R. Schomburgk 849 (BM-2 sh., CGE,W).

V E N E Z U E L A. AMAZONAS: Lower Orinoco, 1896, Rusby & Squires s.n. (NY) and 184 (NY). BOLÍVAR: Abededores de El Dorado, Nov 1948, Aristequieta 3750 (US,VEN); Auyan Tepui, Tannier & Schwabe s.n. (VEN); La Paragua, 70 m, 10 Mar 1940, Williams 12556 (F,VEN) and 12557 (A,F, VEN); San Mateo, Bajo Paragua, 75 m, 10 Apr 1940, Williams 12836 (F, MICH,UC,VEN- 2 sh.); Laja, S of Rio Chiguirete, 420 m, 11 Oct 1954, Wurdack & Guppy 26 (NY,US,VEN). DELTA AMACURO: downstream from Rio Yarakita River, Rio Amacuro, Sierra Imatura, 65-80 m, 9 Nov 1960, Steyermark 87425 (NY,VEN); vic. sawmill between mouth Río Cuyubini & 1st main fork at Hacienda Caicarocoro, 14 Nov 1960, Steyermark 87526 (F,NY,US) or 87562 (F). MONAGAS: Reserva Forestal de Guarapiche, Cano Colorado, Jul 1969, Aristeguieta, Liogier, & Guevara 7165 (US,VEN); Chapopota, area circa de Quiriquire, 20 Nov 1955, Lasser & Vareschi 4151 (VEN); ca 2 km SSW of Jusepin, 125-150 m, 24 Mar 1967, Pursell, Curry, & Kremer 8533 (NY); between La Toscana & Chaguaramal, 100-125 m, 11 May 1967, Pursell, Curry, & Kremer 8838 (NY,US); 6 km E of la Hormiga, 14-50 m, 24 Sep 1955, Wurdack & Monacino 39454 (NY). SUCRE: prov. Mariguita, 1852, no. 6635, herb. Triana 4316 (BM). MIRANDA: San José de los Altos, 8 Feb 1975, Zambrano & Medrano 117-147 (FLAS). ZULIA: ±58 S of Machigues near Mission Los Angeles del Tukuko, 200 m, 15 Oct 1966, Bruijn 1192 (NY,U-2 sh.,VEN).

C O L O M B I A. Rio Casanare, Esmeralda, Los Llanos, 130 m,  
19-20 Oct 1938, Cuatrecasas 3809 (F-2 sh.). BOYACÁ: Orocué, Río Meta,  
350 m, 23-4 Sep 1965, García-Barriga, Hashimoto, & Ishikawa 18534  
(GH,NY).

S T. V I N C E N T S. 1818, Caley s.n. (CGE,NY,W-3 sh.).

L O C A L I T Y U N K N O W N. Guiana, Panama, Trinidad,  
28 Oct 1970, Tuinen [sic] 4245 (U 254533B).

19. Clitoria javitensis (H.B.K.) Benth., Journ. Linn. Soc. 2: 42.

1858. emend. Fantz

Neurocarpum javitense H.B.K., Nov. Gen. Sp. 6: 409. 1823.

Clitoria grandifolia Ducke, Arch. Jard. Bot. Rio de Jan.

5: 141. 1930.

Clitoria portobellensis Beurl., Kingl. Vetenskaps Acad.

Handl. p. 119, 1854.

Ternatea javitensis (H.B.K.) Kuntze, Riv. Gen. Pl. 1: 210.

1891.

Liana, tall, climbing to treetops, or less commonly an erect shrub,  
2-4 m tall, polymorphic. Branches 3-9 mm thick, pith hollow  
longitudinally striate to sulcate, terete, juvenile branch pubescence  
uncinate and short, rufus, pilose, becoming glabrate; bark dark brown,  
peeling in longitudinal strips exposing lighter layers beneath. Leaves  
3-foliate, coriaceous, leaflets variable in shape, size, and pubescence,  
mainly narrow to broadly elliptic-oblong, occasionally elliptic,  
lanceolate-elliptic, lanceolate-ovate, ovate, or oval, apex acuminate  
from an acute to obtuse lamina, acumen 1-3 cm, more or less mucronate,

base broadly cuneate to rotund, midrib impressed above, often more or less short pilose, rarely pilose on primary nerves, primary nerves of 9-13 (15) pair, upper surface green to dark green, glabrous, lower surface green, pubescence typically appressed, short, slightly conspicuous, becoming glabrate to glabrous, or occasionally pilose becoming glabrate with the spreading trichomes confined to nerves, lamina 7-18 (23-28) cm long, 3-9 (18) cm wide. Petiole subterete, longitudinally striated to caniculate, often gradually twisted, 4-17 (25) cm; pubescence uncinata and with rufus, appressed to suberect trichomes, becoming glabrate; rachis 1-4.5 cm. Petiolules subquadrate, 4-9 (10) mm, pubescence uncinata and pilose, rufus. Stipules deciduous, ovate to lanceolate, acute, 3-8 (10) mm long, 1-3 mm wide, pubescence uncinata and appressed, densest towards apex and more or less ciliate; stipels semipersistent, linear to subulate, acute, lateral stipels typically 3-7 mm long, 1-1.5 mm wide, terminal stipels 1-3 (4) mm long, 0.5-1 mm wide. Inflorescences axillary, solitary, and cauliflorous, solitary to few-fascicled, several to multi-flowered, racemose, nodose; axes pubescence dense, short-pilose, more or less rufus, axes typically (0.5) 1-5 cm long, occasionally more elongate, 4-18 cm long. Pedicels 4-9 mm, thickened to 3-4 mm in fruit. Bracts ovate, acute to acuminate, spreading to reflexed in age, pubescence uncinata and appressed; middle pair and outer bract persistent, 2-6 mm long, 1-3 mm wide. Bracteoles minute to short, ovate to lanceolate, broadly acute to short-acuminate, 2-6 mm long, 1-3 (9) mm wide, inserted 1-2 mm below calyx base or occasionally subopposite to alternately inserted, 2-5 mm below the calyx, pubescence appressed, more or less ciliate. Flowers large, showy, (5.5) 6-8 cm, various shades of pink to rose, less commonly lilac

or lavender to pale violet; veins of vexillum dark pink to red or purplish within; alae and carinas whitish to pale pink to rose. Calyx tinged purple, pubescence appressed, uncinat trichomes lacking, tube (15) 17-24 mm long, 5-10 mm wide at base to 8-13 mm wide at throat, lobes broadly deltoid to ovate, acute to short acuminate, 4-8 mm long, 3-4 mm wide at base, ventral lobe subequal, 5-9 mm long, 1-1.5 mm wide. Vexillum pubescence moderate to dense, appressed, rufus becoming tawny, blade 3.5-5 cm wide, claw 15-19 mm. Alae extended well beyond carina 7-10 mm, blade 22-31 mm long, 7-12 mm wide, claw uncinat pubescent, 18-27 mm. Carina falcate, blade 11-18 mm long, 3-6 mm wide, claw 30-38 mm. Staminal tube glabrous, (34) 38-49 mm long, free filaments 2-5 mm; anthers lanceolate, 1.8-2 mm long, 0.5-0.8 mm wide. Gynophore 5-7 mm, pubescence dense, tawny-rufus; ovary 17-22 mm long, 1.5-1.8 mm wide; pubescence dense, appressed, rufus to tawny; style 16-25 (28) mm long, geniculate 6-9 mm from distal end, pubescence uncinat and densely bearded; stigma subcapitate, ca 0.7-0.9 mm wide. Legume long-stipitate, exerted beyond the calyx, flat, green to brown tinged reddish, pendant, weakly raised around seeds, pubescence dense, appressed to suberect, rufus, becoming thinned with age, valves 18-24 cm long, 18-25 mm wide; beak when present typically 3-7 mm; dehiscence causing valve to twist one-quarter to one-half of a turn; stipe 2-3 mm thick, (19) 24-37 mm long, pubescence uncinat and stigose to pilose, rufus. Seeds smooth, thick-lenticular, face suborbicular to slightly longer than wide, dark brown to black, 9-12 mm lon, 9-10 mm wide, 3-4 mm thick, 7-11 seeds per pod; hilum 2 mm x 1 mm. Figures 44 and 45.

The Yavita Clitoria is characterized as a scandent shrub with large pinkish flowers, appressed pubescent calyx, long-clawed vexillum, and



Figure 44. *Clitoria javitensis* - I. Var. *javitensis* f. *javitensis*:  
(a) leaflet, x 1; (b) inflorescence axis, x 1; (c) flower,  
x 1; (d) vexillum, x 1; (e) calyx x 1; (f) ala and carina,  
x 1; (g) androecium, x 1; (h) gynoecium, x 1; (i) legumes,  
x 1; (j) three views of seed, x 1. (Wurdack & Adderley  
43121, NY: a,c. Maguire & Politi 28296, NY 3597: b,d-h.  
Maguire, Cowan, & Wurdack 30420, NY: i. Williams 15676,  
VEN: j.)

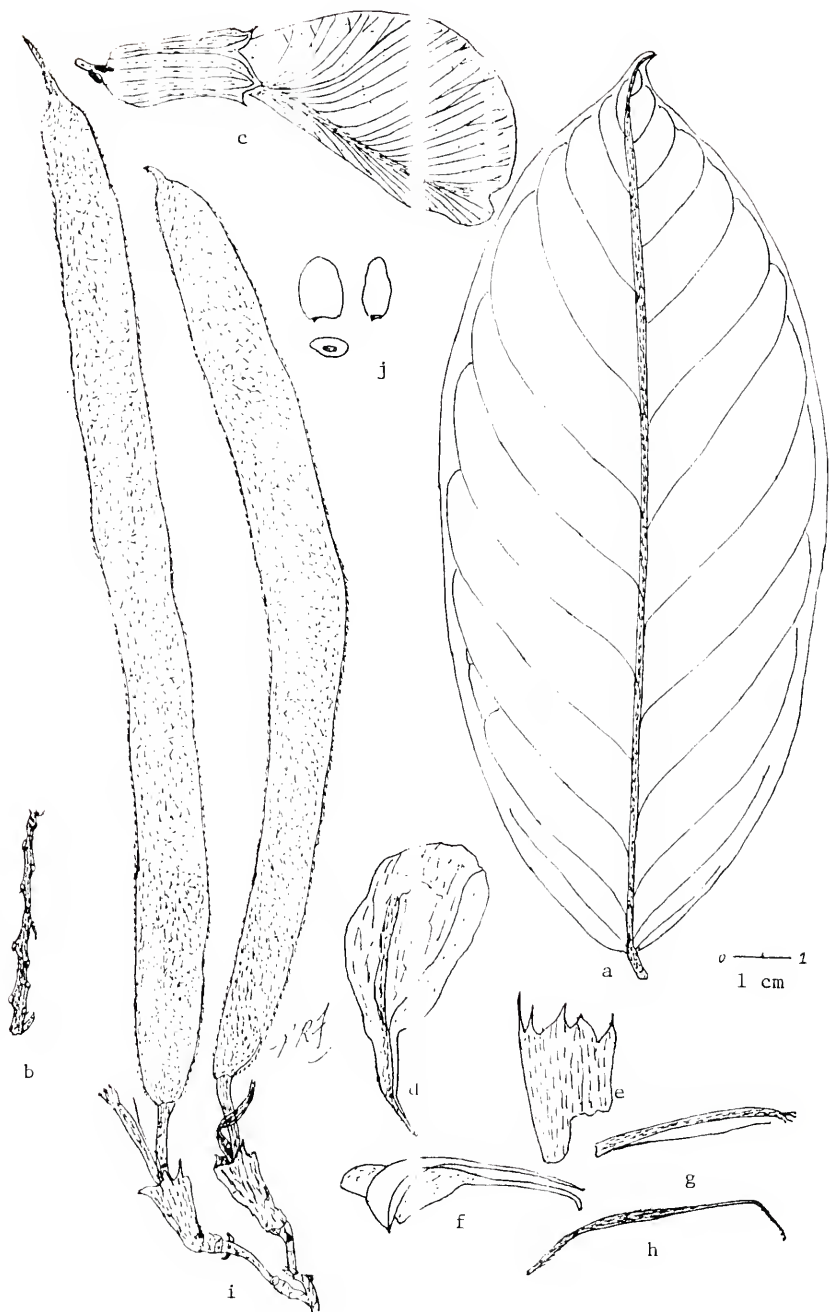
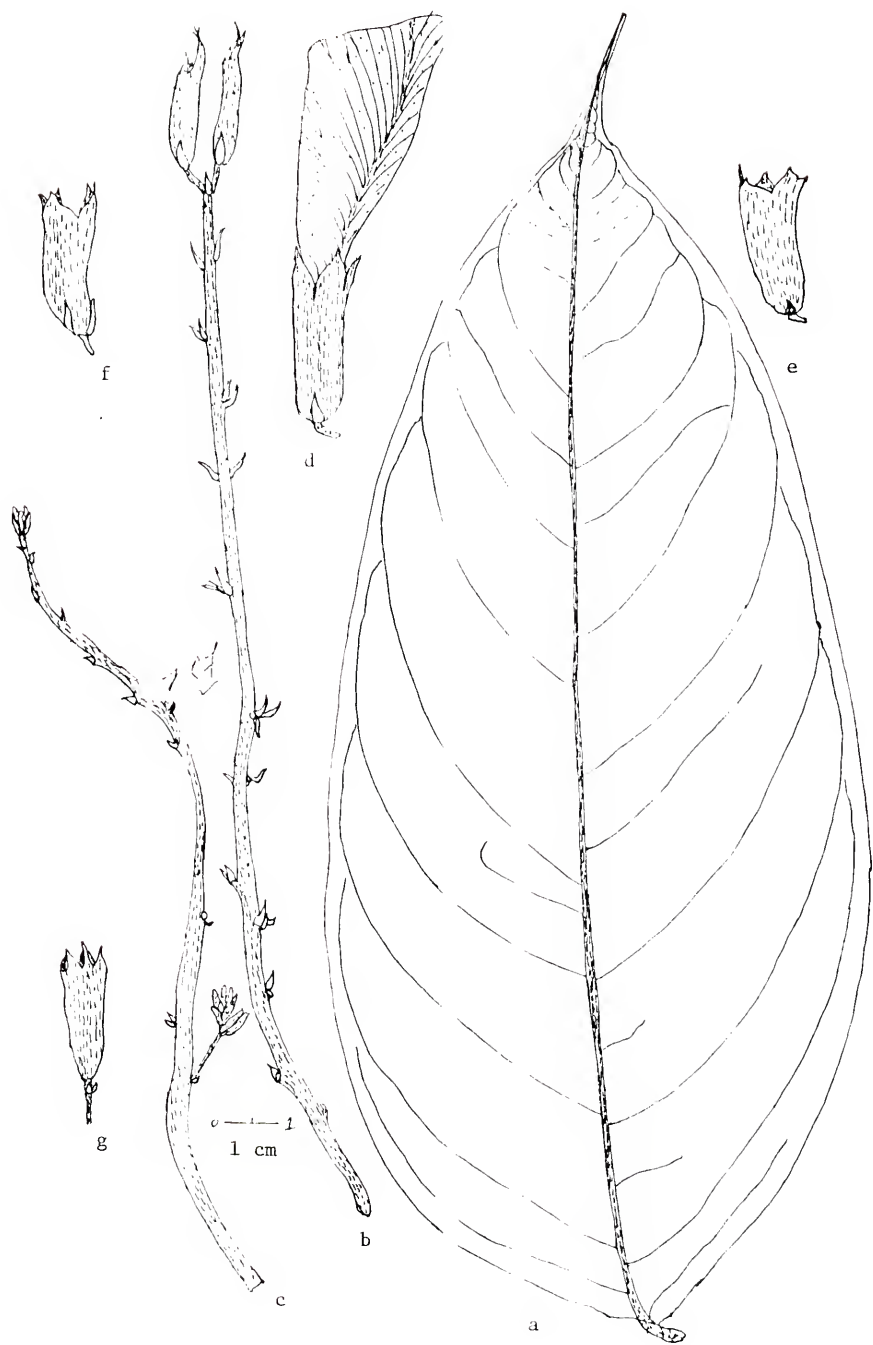


Figure 45. Clitoria javitensis - II. Var. grandifolia: (a) leaflet, x 1; (b) inflorescence, x 1. Var. klugii: (c) inflorescence, x 1; (g) calyx and bracteoles, x 1. Var. longiloba: (d) flower, x 1. Var. javitensis f. bracteosubtenda: (e) calyx and bracteoles, x 1. Var. portobellensis: (f) calyx and bracteoles, x 1. (Ducke 20400, RB 20400: a-b. Klug 173, US 1455172: c,g. Tessmann 3782, S: d. Wurdack & Monachino, 41093: e. Piper 5107, US 1165847: f.)



large fruits with conspicuous rufus trichomes. This species can be easily recognized from all other members of the section Cauliflorae by the larger fruit size and reddish usually fairly dense pubescence, and from most members of the section by the long vexillum claw and lack of uncinata hairs on the calyx and fruit.

PHENOLOGY: This species has a long flowering period, from September to May. Most of the collections made of flowering specimens occurred from November through February. Fruits were usually collected from late December to May.

TYPE COLLECTION: VENEZUELA. Amazonas: Yavita, Humboldt & Bonpland (HOLOTYPE: P-not seen).

The type was not included in the loan specimens to this author. An attempt to obtain this particular specimen, or a photograph of it, proved fruitless as the specimen could not be located in 1975. A representative concept of the type was obtained from three main sources. First, the original description was very detailed. Second, Sandwith (1931) discussed the leaves, calyx, and bracteoles based on his examination of the type at Paris and specimens cited by Bentham in 1858 when he transferred the species from the genus Neurocarpum to the genus Clitoria. Sandwith annotated some of these specimens, such as Spruce 2320-A,<sup>4</sup> noting that the indumentum of the calyx and vexillum,

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4. This specimen at Kew is a mixed collection. Spruce 2320-A represents the branch with leaves mounted at the left, the branch with flowers mounted on the right, and the packet of loose flowers. Spruce 2320-B represents the branch with leaves mounted in the center plus the individual mounted flower. Pencil lines drawn around these were probably made by either Brown or Sandwith, the two whose annotation notes appear on the sheet. The letters were placed by this author to distinguish the parts of the collection and for reference points in citing the material. A material is C. javitensis. B material is C. sagotii.

bracteole size, and general appearance of the calyx "agree well with those of the type of C. javitensis at Paris." Sandwith selected Spruce s.n. (San Carlos, Venezuela, Aug 1853: K!) as the best match to the Paris type from those specimens in Herb. Benth. and Herb. Hook. Third, a collection collected ca 20 km from Yavita (En las malezas de Maroa, Río Guainía, 127 m, Williams 14344) agrees with the description by Humboldt, Bonpland, and Kunth. These two specimens (F 1193498, VEN 4037) also agree with the description by Sandwith (l.c., p. 357) of the type, and match the indumentum of the calyx and vexillum, bracteole size, and general appearance of the calyx and leaves of Spruce 2320-A. Thus Williams 14344 and Spruce s.n. served as a substitute for the type.

The concept of this species has changed with time. Bentham (1858) transferred the species from the genus Neurocarpum to the genus Clitoria. In addition to the type, he cited several additional specimens, which included Spruce 1877 and 2320 from northern Brazil, and Rob. Schomburgk 1000 and Rich. Schomburgk 1723 of British Guiana. This produced a much broader interpretation on the species. Sagot (1882) described a variety (C. javitensis var. glabra) based upon his collection, Sagot 120, from French Guiana. In the mid 1920's, N. E. Brown annotated the Kew sheets of the Bentham "types" and concluded (as indicated by his annotations on these sheets) that most of these specimens were distinct from each other. He referred to them as distinct species, but never named them. Sandwith (1931) concluded that C. javitensis had much variation in length and position of the bracteoles, in the size of the calyx, corolla, and leaves, and in leaf pubescence. He concluded that there were two basic groups, which he treated as varieties. The typical variety included the Humboldt & Bonpland (type) and Spruce 1877

specimens. The Sagot variety (var. glabra) included Sagot 120, Schomburgk 1000, Schomburgk 1723, and Spruce 2320, plus additional specimens cited by Sandwith for the first time. Based upon the identifications of uncited specimens examined by the author of the present study, Sandwith's treatment generally has been accepted.

The present treatment disagrees with Sandwith's concept, and corresponds closely to N. E. Brown's conclusions. The author of this study has examined those specimens cited in the early literature plus many more that fit the broad interpretation of C. javitensis as viewed by Sandwith. They contain a mixture of morphologically variable plants that can be separated into distinct groups by both morphological and geographical characters. The concept of C. javitensis in this treatment has been amended to exclude Sagot's variety, (i.e. exclude C. javitensis var. glabra) and the Spruce 1877 specimen. In addition, two new names, C. portobellensis Beurl. and C. grandifolia Ducke, have been placed in synonymy.

A new species has been established for those specimens included under the concept of C. javitensis var. glabra. This species has been given the name C. sagotii (the name C. glabra would cause confusion with the existing species, C. glaberrima). Clitoria sagotii differs from C. javitensis by many characteristics, including morphological differences in the vegetative structures, the inflorescence and its associated structures, the floral parts, the reproductive structures, the fruits, and the seeds. Table 8 summarizes some of these differences. In general, C. sagotii is found in the Guianas and rarely in Venezuela or Brazil, with C. javitensis distributed in Venezuela, Colombia, Peru, western Brazil (Amazonas), and Central America. Sagot 120 and French

Table 8. A comparison of some structures between C. javitensis (H.B.K.) Benth. and C. sagotii Fantz.

CHARACTER	C. JAVITENSIS	C. SAGOTII
LEAVES:		
midrib above*	Impressed	Raised
INFLORESCENCE:		
length*	1-6 cm (occ. to 20 cm)	Subsessile to 0.5 cm
pubescence*	rufo-strigose	predominately uncinata
CALYX:		
tube*	17-24 mm	11-16 mm
pubescence*	appressed	uncinate predominately
lobes	4-8 mm	5-8 or 8-13 mm
BRACTEOLAS:		
length	2-3 mm or 4-6 mm	4-7 mm or 8-11 mm
insertion	1-2 mm (occ. 2-5 mm)	2-5 mm
VEXILLUM:		
claw*	15-19 mm	6-9 mm
pubescence*	tawny-rufo appressed	uncinate, few appressed
ALAE:		
beyond carina	8-10 mm	8-13 mm
blade length*	24-30 mm	17-21 mm
CARINA:		
shape*	falcate	nearly straight
claw*	30-38 mm	25-32 mm
FLOWER SIZE	(5.5) 6-8 cm	5-6 cm (occ. 6-8 cm)
ANDROECIUM:		
column	(34) 38-49 mm	32-39 mm
free filaments	2-5 mm	4-7 mm
connective	acute	apiculate
GYNOECIUM:		
ovary length*	17-22 mm	10-14 mm
ovary pubescence*	rufus to tawny	white tinged yellow
ovary width*	1.5-1.8 mm	1-1.2 mm
LEGUME:		
length*	18-24 cm	9-15 cm
width*	18-24 mm	15-18 mm
pubescence*	dense rufo-appressed	uncinate + scattered pilose
stipe	24-33 mm	30-37 mm
dehiscence*	1/4 to 1/2 turn	1-2 turns



Table 8. - Continued

CHARACTER	C. JAVITENSIS	C. SAGOTII
SEEDS:		
length*	9-12 mm	6-7 mm
width*	9-10 mm	7-8 mm
thickness	3-4 mm	5 mm
longer axis	length	width
seeds per pod	7-11	4-8

\*major differences

Guiana specimens represent one variety (C. sagotii var. sagotii). Schomburgk 1000 and Schomburgk 1723 and other Guyana collections represent a second variety (C. sagotii var. caniculata). Spruce 2320-B and a couple of additional collections of the western Amazon basin represent a third variety (C. sagotii var. sprucei). Additional data on the species are found under the treatment of C. sagotii species number 23.

Spruce 1877 appears similar to C. javitensis in general appearance, except for the longer calyx lobes. Upon examination, there are several conspicuous differences, including floral and reproductive structures. This specimen agrees with Cavalcante 2570 which has uncinat pubescent fruits, which are not characteristic of C. javitensis. Additional data are found under the species C. cavalcantei, species number 20.

Of the early cited collections for C. javitensis, only Spruce 2320-A and Spruce s.n. are retained with the type collection in the concept of C. javitensis in this treatment.

The type specimen for the name C. portobellensis is at Stockholm (Panama: In silvis monitium, Porto-Bello, Apr 1826, Billberg s.n. !). This specimen and other Panamanian collections differ from the type of C. javitensis by the longer stipules, bracts, and bracteoles, and in having the bracteoles subtending the calyx base. Specimens in fruit had stipes that averaged somewhat shorter in length. The specimens agreed highly in all other structures. These few differences suggested that one species was involved. Thus C. portobellensis Beurl. is synonymized with C. javitensis and reduced from a species to the varietal level as C. javitensis var. portobellensis.

Ducke cited three collections (syntypes: Ducke 20400! Ducke 20399! Kuhlmann 1493!) from the Botanical Garden Herbarium at Rio de Janeiro when he published the name C. grandifolia. These specimens differ conspicuously from the type collection of C. javitensis by the elongate inflorescence and the larger leaves (herein called the "grandifoliate" leaf). The inflorescences were multiflowered, with fruits on one collection and aborted flowers on the other. The "grandifoliate" leaf was much larger in size, long-petiolate, and had longer petiolules. Leaflets varied from glabrous to rarely pilose below, with both extremes occurring in the same collection. The fruit and seeds match those of C. javitensis, as do the calyx, floral structures, and reproductive structures. The calyx lobes, stipules, and bracteoles were longer than the type specimen of C. javitensis, but their size agreed with the variation in additional specimens that matched in most structures, including the inflorescence and leaves. Within the C. javitensis complex, specimens exist with shorter inflorescences and "grandifoliate" leaf types. Also, some specimens occasionally will exhibit slightly longer inflorescences, up to 10 cm, especially in some of the cultivars associated with the Central American material. In other species (i.e. C. arborea, C. polystachya), there exist a number of collections with elongate inflorescences and others with contracted inflorescences. Since most structures agree with those found in C. javitensis specimens, and the only major differences that occur are in the size of the inflorescence, petiole, petiolule, and lamina of the leaf, the name C. grandifolia Ducke is synonymized with C. javitensis. As with the Central American name, C. grandifolia Ducke is reduced from the species level to the varietal level, as C. javitensis var. grandifolia.

VERNACULAR NAMES: VENEZUELA. (AMAZONAS): Yanomonö (Indios Guaicas), Aristeguieta & Lizot 7444.

ECONOMIC IMPORTANCE: This species has been cultivated for its climbing habit and its large, showy, pink flowers. When grown in open places, the plant assumes a shrubby habit. The flowers are important to the insects in the community. In Bolivar, Venezuela, Steyermark 74763 reported that the flowers harbor stinging ants. From the Barro Colorado Island in Panama, Duke 15039(2) reported that the flowers are very attractive to ants (Paraponera), bees, and thrips. In Colombia, Hermann 11208 reported the roots had the odor of cucumber. Some of the species of subgenus Neurocarpum are reported to have odoriferous roots, and are noted for lack of insect and nematode damage.

NOTES: Clitoria javitensis is a polymorphic species which exhibits a range of variation in its habit, bracteole insertion below the calyx, and in the size of the leaflets, stipules, petioles, inflorescence, bracts, bracteoles, and calyx lobes. This complex needs further study incorporating experimental methods. From a morphological standpoint, certain combinations of characters will consistently occur in plants from defined geographic areas. These distinct groups are treated nomenclaturally. They are easily recognized and segregated in a key. Few exceptions occur, and where they do, these difficulties are noted in the key.

Comments will be made first regarding the variation in structure, and secondly, in the combination of characters that occurs within a single geographic region. The habit of the species is usually reported as a woody vine or a liana. Occasionally, the species is noted as an erect shrub 2-4 m tall, or as a scandent shrub. Johnston (1949)

expanded on the habit of individuals on San José Island noting it was a woody vine in dense forest and an erect shrub in thickets and in more open areas. Rarely, tree habits are reported (i.e. Killip 34304), although morphologically these specimens are indistinguishable from the climbing specimens collected. The only exception was the two arborescent specimens from Peru which were segregated morphologically and treated as var. klugii.

The leaves and its associated structures are highly variable. Leaves generally can be divided into two groups, called the "typical leaves" (those which match the type specimen) and the "grandifoliate leaves." The typical leaf is short-petiolate, has a short petiolule, and a smaller sized leaflet. The petiole usually is 4-12 cm long sometimes elongating to 13-15 cm on larger leaflets. The petiolules are usually 4-6 mm long to rarely 7-8 mm on larger leaflets. The typical leaflet is elliptic to elliptic-oblong or lanceolate-elliptic, 7-18 cm long, 3-7 (9) cm wide. The grandifoliate leaf is long-petiolate, has a long petiolule, and a larger sized leaflet. The petiole is usually 10-20 (25) cm long, even on younger leaves. The petiolule is usually (6) 7-10 mm. The grandifoliate leaflet is usually ovate, ovate-elliptic, to lanceolate-ovate, becoming very broad, 15-28 cm long, 6-15 cm broad. The typical leaf is generally associated with shorter inflorescences, whereas the grandifoliate leaf is often found on individuals with elongate inflorescences. But some exceptions do occur, particularly in Meta, Colombia and parts of Amazonas, Venezuela. Therefore, the typical leaf and the grandifoliate leaf type are helpful as supportive characters, but not reliable as diagnostic characters.

The stipules of those members of Central America and most of South America are generally 6-10 mm long. In Amazonas, Venezuela, and adjacent geographical areas, the stipules are consistently 3-5 mm long, with rarely a stipule of 6 mm. Stipules are deciduous, and not always observed on a particular specimen.

The most common inflorescence is short, (0.5) 1-6 cm long, few-flowered. Rarely an individual may possess an inflorescence 8 cm long or in cultivars to 10 cm. The uncommon inflorescence is elongated, usually 4-18 cm long, multi-flowered. Problems may arise in identification with those specimens whose inflorescences are 4-7 cm long, as in a number of Meta, Colombia, collections. Pedicels can be used as a supportive character. The short inflorescence type has pedicels commonly 3-7 mm, although some individuals may bear longer pedicels. The long inflorescence type has pedicels of 6-11 mm.

Bracts are typically minute, 2-3 (4) mm long, highly consistent in South American members. Bracts of Central American and the adjacent Colombian members are noticeably longer, rarely 3 mm long, commonly 4-6 mm. The bract length refers specifically to the middle pair of bracts which are more persistent, usually the largest, and are concave and subtending the pedicel. The outer bract is more or less persistent, and if present, may be slightly shorter.

Bracteoles are commonly 4-7 mm long. Specimens from Amazonas, Venezuela, and adjacent areas have minute bracteoles, typically 2-3 (4) mm long. In addition, these minute bracteoles often are inserted 2-5 mm below the calyx base whereas most bracteoles subtend the base, inserted 1-2 mm below it.

Calyx lobes are commonly 4-6 mm long, broadly deltoid with the length subequalling the width or to 1.5 times the width at the base. The apex is acute or sometimes short-acuminate. This type of calyx lobe is typical of Central American members and of most of those from South America. In Peru and the western Amazon basin, calyx lobes are elongate, the length nearly twice the width, with an acuminate to subulate apex. This lobe type is mostly associated with individuals having the longer inflorescences.

The stipe is 19-37 mm long. Specimens with elongated inflorescences have stipes 19-24 mm. Central American specimens have stipes that averaged 24-32 mm. Other South American specimens with shorter inflorescences have stipes 28-37 mm.

A comparison of the patterns of variation and combinations of structures that are associated together suggest five distinct groups. The five varieties recognized in this treatment are summarized in Table 9.

The typical variety must be the one that includes the type from Amazonas, Venezuela. This group is quickly recognized by the minute bracteoles inserted well below the calyx, and the short stipules. The inflorescence is short with flowers bearing short calyx lobes, and fruits long-stipitate. The leaves are of the typical type. This group is treated as variety javitensis.

A second group is very similar, although the bracteoles are 3-4 mm long and inserted at the calyx base. This difference is a minor variation from the typical bracteole form, and therefore, this group is treated as a form, C. javitensis f. bracteosubtenda.

Table 9. A comparison of some structures between the varieties of *C. javitensis*.

CHARACTER	JAVITENSIS	PORTOBELLENSIS	LONGILOBA	GRANDIFLORA	KLUGII
INFLORESCENCE	Short	Short	Short	Long	Long
LEAF TYPE	Typical	Typical	Typical	Grandifoliate	Typical
PETIOLE	Short	Short	Short	Long	Long
PETIOLULE	Short	Short	Short	Long	Short
STIPULE	Short	Long	Long	Long	Long
BRACTS	Short	Long	Short	Short	Short
BRACTEOLE LENGTH	Short	Long	Medium	Long	Medium
BRACTEOLE INSERTION	Subtend or Below 2-5 mm	Subtend	Subtend	Subtend or Below 2-3 mm	Subtend
CALYX LOBES	Short	Short	Long	Long	Long

	<u>Short</u>	<u>Long</u>	KEY:	<u>Typical</u>	<u>Grandifoliate</u>
KEY: Inflorescence	(0.5) 1-6 cm	4-18 cm	Leaflet length	7-18 cm	15-28 cm
Petiole	4-10 (14) cm	10-20 (25) cm	Leaflet width	3-7 (9) cm	6-15 cm
Petiolule	4-6 (8) mm	6-10 mm	Leaflet basic shape	Oblong-ellip.	Ovate
Stipule	3-5 mm	6-10 mm			
Bracts	2-4 mm	4-6 mm			
Bracteole	2-4 mm	4-7 mm			
Calyx lobes	4-6 (7) mm	(5) 6-9 mm			



A third group is easily recognized by the elongate bracts and its Central American distribution. In addition, the stipules and bracteoles are longer than the typical variety, and the stipe is shorter. This group is treated as var. portobellensis, making a new combination from the prior specific epithet for this group. The leaves have appressed to glabrate pubescence on the lower surface as in the typical variety, but a frequently appearing form has a pilose pubescence, an uncommon pubescence type in the species. These members are treated as var. portobellensis f. pilosa. There also occurs a rare leaf shape in this group in which the leaflet apex is truncate. This apex type is unknown elsewhere in the subgenus Bractearia, and rarely occurs in other species distributed in Africa (e.g., C. kaessneri) or Southeast Asia (e.g., C. javanica). This form is treated as var. portobellensis f. truncata.

A fourth group was noted that has the typical leaf type and short inflorescences, but much longer calyx lobes. The stipules and bracteoles are also longer than the typical variety, although the bracts agree. Fruits in this group were not observed, thus the stipe length is unknown. These members are distributed in Peru. This group is treated as var. longiloba.

A fifth group is quickly recognized by its elongated inflorescences and the "grandifoliate" leaf type. Calyx lobes are longer than the typical variety as well as the stipules and bracteoles. This group is treated as var. grandifolia, making a new combination from the prior specific epithet applied to this group.

The placement of the last group is somewhat problematic. Most characters agree within the variation found in the C. javitensis complex.

The elongate inflorescence and long-petiolate leaves suggest var. grandifolia, but there are several differences, notably in the pubescence of the ovary, habit, and size of the petals, style, petiolules, and leaflets. The two collections comprising this group are reported as trees (only Killip 34304 is reported as a tree from the complex) and, atypically, have an ovary pubescence that is white with a yellow tinge toward the trichome apex. Members of the C. javitensis complex have reddish-brown to yellowish-brown trichomes. This suggests that these two members are distinct from C. javitensis, although all other characters are in more or less agreement. Species with whitened pubescence on the ovary typically have uncinatate pubescent fruits, but fruits are unknown in this group. Both specimens are from Peru, whereas those species with fruits bearing uncinatate trichomes are typically found in the Guianas and adjacent Brazil. With a lack of segregational characters, this group is presently treated as var. klugii, rather than as a new species.

Clitoria javitensis has close affinities with C. arborescens from which it can be easily distinguished by the non-tomentose leaflets, the lack of uncinatate trichomes on the calyx, the much shorter bracteoles, and larger flowers.

DISTRIBUTION (Figures 46 and 47): The species has a wide distribution in South America, north and west, from the western Amazon Basin with an extension into Central America. Members are commonly found in southern Venezuela, western Brazil, Peru, Colombia, and Panama. Those plants known as C. javitensis var. glabra in the Guianas and parts of Brazil, belong to other species. The species is found in

Figure 46. South American distribution of Clitoria javitensis, section Cauliflorae. Var. javitensis f. javitensis (●); var. portobellensis f. portobellensis (★); var. longiloba (⊛); var. grandifolia (▼); var. klugii (▲).

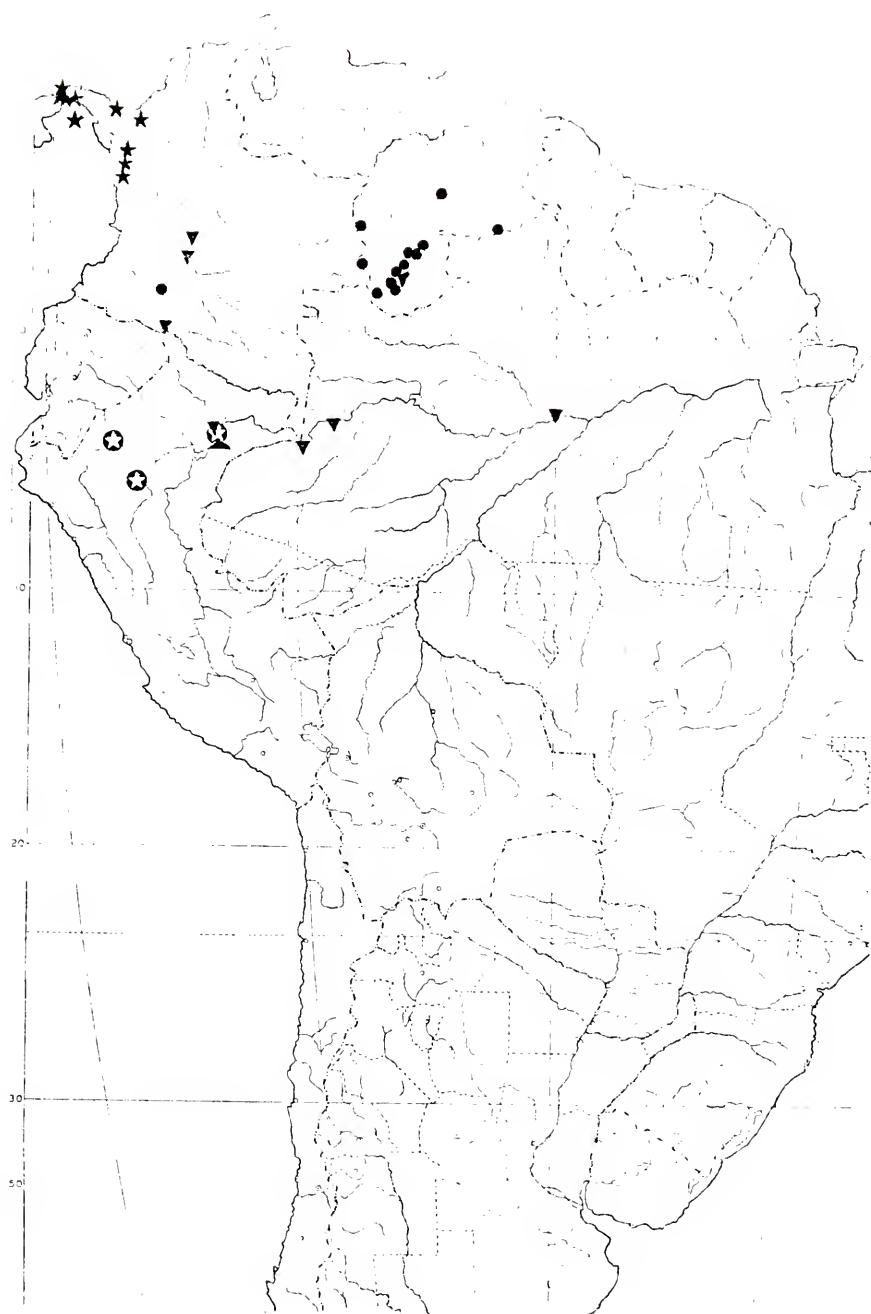
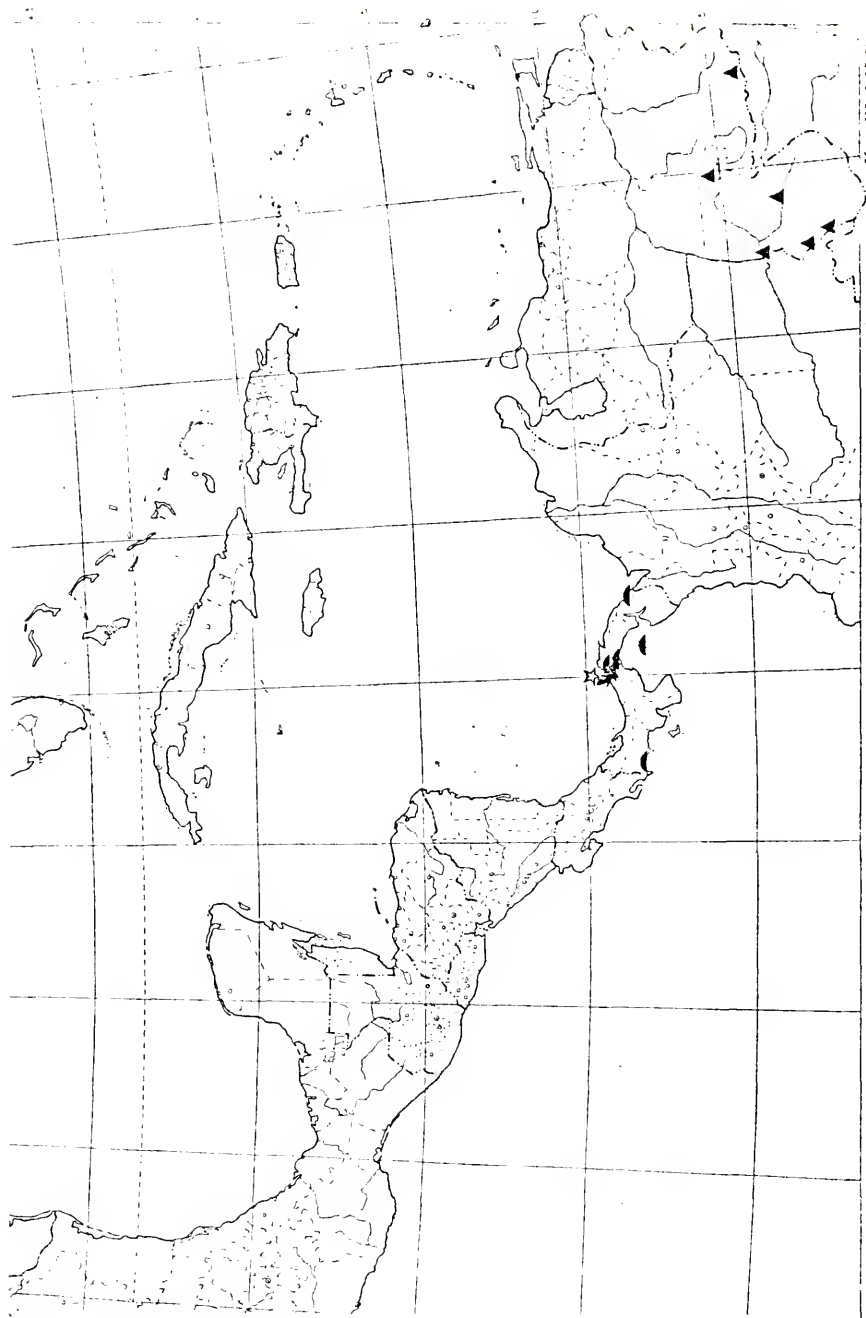


Figure 47. Central American and northern South American distribution of *Clitoria javitensis*, section *Cauliflorae*. Var. *javitensis* f. *bracteosubtenda* (▲); var. *portobellensis* f. *pilosa* (●); var. *portobellensis* f. *truncata* (☆).



tropical humid forest, infrequently in thickets or scrub, usually associated with sandy soil, at elevations up to 500 (800) m.

KEY TO VARIETIES AND FORMS:

1. Inflorescence short, 0.5-6 cm long, few-flowered; leaves typically short-petiolate, petiole 4-10 (15) cm; petiolule 4-6 mm, rarely longer (to 8 mm); stipe elongate, 24-37 mm long.
2. Calyx lobes with length subequal to 1.5 times the width, 4-6 mm long, apex acute to short-acuminate.
3. Bracts minute, 2-3 (4) mm; stipules short, 3-5 (6) mm; stipe averaging longer, 28-37 mm (Central and Western Amazon Basin) . . . . . 19a. var. javitensis
4. Bracteoles minute, 2-3 (4) mm long, subopposite to alternate on the pedicel, inserted 2-5 mm below calyx base, apex below calyx base or more or less reaching it but below the disc . . . . 19aa. f. javitensis
4. Bracteoles typically longer, (2) 3-4 (5) mm, subopposite, subtending calyx base, inserted 1-2 mm below, apex more or less reaching the swollen calyx base represented internally by the disc . . . . .  
. . . . . 19ab. f. bracteosubtenda
3. Bracts large, 4-6 mm; stipules long, (5) 6-9 (10) mm; stipe averaging shorter, 24-32 mm (Central America and adjacent Colombia; N. Venezuela) . . . . 19b. var. portobellensis
5. Leaflet apex tapering, acuminate
6. Leaves with pubescence on lower surface inconspicuously appressed to glabrate, trichomes on nerves appressed, non-spreading . 19ba. f. portobellensis

6. Leaves with pubescence on lower surface  
conspicuously pilose to glabrate, trichomes  
on nerves spreading to suberect . . . . .  
. . . . . 19bb. f. pilosa
5. Leaflet apex truncate, more or less retuse . . .  
. . . . . 19bc. f. truncata
2. Calyx lobes with length nearly twice the width, (5) 6-9 mm long,  
apex acuminate to short-subulate (Peru) . 19c. var. longiloba
1. Inflorescence elongated, 4-18 cm, multi-flowered; leaves typically  
long-petiolate, petiole commonly 10-20 (25) cm; petiolule typically  
6-9 mm, rarely shorter (var. klugii); stipe short, 19-24 mm.
7. Ovary pubescence reddish to yellowish brown; style 27-30 mm;  
ala blade 25-33 mm long; carina blade 15-18 mm long;  
petiolules 6-10 mm; rachis typically 3.5-5 cm; scandent shrub  
(Western Amazon Basin) . . . . . 19d. var. grandifolia
7. Ovary pubescence white, tinged yellow; style 22-25 mm; ala  
blade 21-25 mm; carina blade 12-15 mm; rachis 2-4 cm;  
petiolule 4-6 mm; tree (Peru) . . . . . 19e. var. klugii

19a. Clitoria javitensis (H.B.K.) Benth. var. javitensis

Leaflets typically small, 7-18 cm long, 3-7 (9) cm wide. Petiole short, 4-10 (14) cm. Petiolule 4-6, rarely to 8 mm long. Stipules short, 3-5 mm. Inflorescences few-flowered, short, (0.5) 1-6 cm, rarely to 8 cm. Pedicels commonly 3-7 mm, occasionally to 9 mm. Bracts short, 2-4 mm. Bracteoles small, 2-4 mm. Calyx lobes 4-6 (7) mm,



length subequal to 1.5 times the width, apex acute to short-acuminate. Stipe 28-37 mm.

DISTRIBUTION (Figures 46 and 47): This variety is distributed in the central and western Amazon Basin which includes southern Venezuela and Colombia, and Amazonas, Brazil. The bulk of the typical form is centered in Amazonas, Venezuela. Most members of form bracteosubtenda are found in Colombia, Bolivar, Venezuela, and Amazonas, Brazil.

19aa. Clitoria javitensis var. javitensis f. javitensis

Bracteoles minute, 2-3 mm long, rarely 4 mm, subopposite becoming alternate on pedicels, inserted below calyx base 2-5 mm, apex below the calyx base or more or less reaching it, but below the disc.

DISTRIBUTION (Figure 46): Hort. Kew, 1850, Forsberg s.n. (S-2 sh.).

V E N E Z U E L A. Croizat 922 (NY) and 928 (NY); 17 May 1942, Williams 15650 (VEN). AMAZONAS: along Cano Maminare, a back-water caño emptying eastward just north of Caño Darati, 140 m, 2 Apr 1953, Maguire & Wurdack 34783 (NY); Playa alta, 3 Nov 1950, Maguire, Cowan, & Wurdack 29363 (NY, VEN); along Río Padamo ca 15 km above mouth, 150 m, 27 Mar 1953, Maguire & Wurdack 34716 (NY, VEN); Capibara, arboredas del Casiquiare, 120 m, 29 May 1942, Williams 15676 (F, VEN); Brazo Casiquiare above Capibara, 20 Jan 1931, Holt & Blake 661 (US); at mouth of Río Pamoni and Río Casiquiaro, 130 m, 12 Feb 1954, Maguire, Wurdack, & Bunting 37677 (NY); Mavaca, alto Orinoco, Jan 1970, Aristeguieta & Lizot 7444 (VEN); El Temblador, Río Orinoco, entre San Antonio y Ki, 6 May 1971, Foldats 252-A (VEN); along Río Orinoco just above Tamatama, 150 m, 22 Jun 1959, Wurdack & Adderly 43121 (NY); Orinoco R., southern

part of Isla de Ratón, 5°2'N-67°46'W, 90 m, 19 Nov 1965, Breteler 4736 (U,VEN); abajo de Esmeralda, 143 m, 13 May 1942, Williams 15348 (F,G, NY,RB,US,VEN); above Caño Guasuriapán, Rio Atabapo, 1 km above San Fernando de Atabapo, 120-130 m, 16 Nov 1953, Maguire, Wurdack, & Bunting 36249 (NY-2 sh.,RB); Moroa, Río Guainía, 9 Feb 1942, Williams 14214 (VEN); l.c., 127 m, 14 Feb 1942, Williams 14344 (F,VEN); San Carlos, Aug 1853, Spruce s.n. (K-432); prope San Carlos, 1853-4, Spruce 3543 (NY-mixed; non G,GH,CGE,F,K,RB,W); above Raudal Pacure, Río Cunucunuma, 9 Nov 1950, Maguire, Cowan, & Wurdack 24903 (NY,VEN); Culebra Savanna, Río Cunucunuma, 25 Dec 1950, Maguire, Cowan, & Wurdack 30420 (NY); along Río Saipa between Río Casiquiare and mouth of Caño Hechimoni, 120 m, 25 Jul 1959, Wurdack & Adderly 43616 (NY); along Río Siapa near mouth, 130 m, 4 Apr 1953, Maguire & Wurdack 34833 (NY); vic. base camp, Cerro Sipapo (Paráque), 17 Jan 1949, Maguire & Politi 28419 (BM,NY,US); l.c., 10 Jan 1949, Maguire & Politi 28296 (NY,US); vic base camp, Cerro Yapacana, entre el Campamento y la Sabana Grande, 3°45'N-66°45'W, 125 m, Steyermark & Bunting 103211 (VEN); Isla de Callare, raudal del Trapichote, delta del Ventuari, 125 m, 21 Apr 1942, Williams 15002 (F,S,VEN).

B R A Z I L. AMAZONAS: Rio Negro, Uacana, 22 Apr 1947, Fróes 22195 (U); Inambú, 17 Nov 1952, Romero-Castañeda 3600 (MO).

C O L O M B I A. VAUPÉS: Río Kuduyarí, middle and lower course, 1°15'N-70°5'W, 700-800 ft, 16 Oct 1952, Schultes & Cabrera 17862 (GH, NY,US); Bocas del Carurú, orillas caño, 230 m, 27 Sep 1939, Cuatrecasas 7063 (US); Río Cuduyarí orillas, afluente del Vaupés, 200 m, 15 Sep 1939, Cuatrecasas 6822 (US); Yapoboda, 10 Dec 1943, Allen 3247 (MO).

META: Llanos Orientalis, selva higrófila del caño de Quenare, 400 m, 22-23 Feb 1941, Dugand & Jaramillo 2904 (US-2 sh.); Caño del "Tigre" en los desechocondura del Río Cubuyarito, Feb 1935, Garcia 4973 (US); Sierra de la Macarena, Río Guapaya, 500 m, 2 Dec 1949, Philipson, Idroho, & Fernandez 1669 (BM,F).

19ab. Clitoria javitensis (H.B.K.) Benth. var. javitensis f. bracteosubtenda Fantz, f. nov.

Bracteoles small, (2) 3-4 (5) mm long, subopposite on pedicel and subtending the calyx base, inserted to 2 mm below calyx base, apex more or less reaching the abruptly swollen area of calyx base (representative of internal disc).

TYPE COLLECTION: VENEZUELA. Bolívar: Río Parguaza, between mouth and El Carmen, 50 km upstream, 80-110 m, 3 Jan 1956, Wurdack & Monachino 41093 (HOLOTYPE: NY. Isotypes: US 2167581 & 2167582, VEN 40651).

The New York specimen has a number of flowers with bracteoles of different sizes, but all subtending the calyx as is typical of this form.

DISTRIBUTION (Figure 47):

V E N E Z U E L A. BOLIVAR: Río Nichare (afluente Río Caura) arriba de la desembocadura con el Río Cicuta (Icuta), 6°15'N-65°5'W, 200-250 m, 25 Apr 1966, Steyermark 95733 (NY,US,VEN); entre el Río Paramichi y el Salto de Chalimano, sureste hacia la frontera Ven.-Brazil, N de la Serranía Pia-soi (Pia-shauhy, 525-650 m, 5 Jan 1962, Steyermark 90594 (VEN); Río Paragua, Salto de Auraima, 10 Apr 1943, Killip 37374 (VEN; vic. camp 1 along Río Abácapa, NW slopes of Abácapa-Tepuí, 420 m, 30-31 Mar 1953, Steyermark 74763 (F-3 sh.,NY-3sh.,VEN).

AMAZONAS: Fish Creek, Esmeralda, 350 ft, Aug 1928-Apr 1929, Tate 964 (NY); Murcielago Falls, Sipapo River, 17 Nov 1948, Maguire & Politi 27314 (NY,US); Sabana de Asisa, 11 Feb 1949, Phelps & Hitchcock 458 (NY); la Isla Laolao, Bajo Caño San Miguel, Río Guainía, 127 m, 24 Mar 1942, Williams 14863 (F,US); San Carlos de Río Negro, 100 m, 6 May 1942, Williams 14667 (VEN).

B R A Z I L. AMAZONAS: Rio Negro Marabitanas, 20 Apr 1947, Pires 483 (NY-2 sh.); Porto Curucuhy, S. Gabriel, Rio Negro, 6 Oct 1945, Froes 21116 (NY); Sao Gabriel, May 1852, Spruce 2320 (K-mixed). RONDÔNIA: Rio Abunã 3 km above confluence of Rio Negro, north bank, 16 Nov 1968, Prance et al. 8508 (NY).

C O L O M B I A. AMAZONAS: Río Igaraparaná, las arredadores de La Chorrera, 180 m, 4-10 Jun 1942, Schultes 3954 (F,K). CAQUETA: Florencia, Dec 1930, Arbelaez 734 (US). VAUPÉS: Río Negro, San Felipe and vic., below confluence Río Guainía and Rio Casiquiare, 1°50'N-67°0'W, 600 ft. 25 Oct 1952, Schultes, Baker, & Cabrera 18044 (NY,US). META: Llano de San Martín, Quename, 250 m, Jan 1856, no. 6635, hb. Triana 4314 (BM); Quetame, Bogotá, Rarsien (?) s.n. (W); Sabanas de San Juan de Arana, margen izquierda del Rio Guejar, alrededores del aterrizaje "Los Micas," 500 m, 22 Jan 1951, Idrobo & Schultes 1261 (U,US). NARINO: Barbacoas Sta., 15 Oct 1862, Hayes s.n. (BM-mixed).

19b. Clitoria javitensis (H.B.K.) Benth. var. portobellensis  
(Beurl.) Fantz, comb. nov.

Clitoria portobellensis Beurl., Kongl. Vetenskaps Acad.  
Handl. p. 119. 1854.

Leaflets typically small, 7-18 cm long, 3-7 (9) cm wide. Petiole short, 4-10 (14) cm. Petiolule 4-6 (8) mm. Stipules long, 6-9 (10) mm. Inflorescences few-flowered, (0.5) 1-6 (8) cm. Pedicels 3-7 (9) mm. Bracts long, 4-6 mm. Bracteoles long, 4-7 mm long, inserted 1-2 mm below the calyx base, subtending it. Stipe 24-32 mm.

TYPE COLLECTION: PANAMA. In silvis montium, Porto-Bello, Apr 1826, Billberg s.n. (LECTOTYPE: S-herb. Regnell.

Beurling did not select a type specimen. He published the locality data as "In silvis montium." The name was published as "Clitoria (Vexillaria?) portobellensis" which agreed with the identification on the Billberg specimen deposited in a type folder at Stockholm. Based upon the label data and the agreement of the specimen with the published description, the Billberg s.n. specimen (S) was the probable specimen examined by Beurling upon which the name was based, and therefore, it was selected as the lectotype.

DISTRIBUTION (Figures 46 and 47): This variety is frequently collected in Panama and the adjacent provinces of northwest Colombia. Additional collections have been made infrequently in northern Venezuela and Costa Rica.

19ba. Clitoria javitensis (H.B.K.) Benth. var. portobellensis  
(Beurl.) Fantz f. portobellensis

Leaves with pubescence on lower surface appressed, becoming glabrate, trichomes then confined to major nerves, more or less inconspicuous, appressed.

DISTRIBUTION (Figure 46): A few collections are leafless, and designation of a form name is impossible. These collections are cited with the more common, typical form, and marked with the symbol "\*" before the institutions.

C O L O M B I A. ANTIOQUIA: swampy area on peninsula ca 1 km W of Turbo, ca 8°5'N-76°43'W, sea level, 31 Mar 1962, Feddema 2106 (MICH), CHOCÓ: Bahia Solano, Puerto Mutis, 0-20 m, 4 Jan 1973, Gentry & Forero 7179 (MO); Truandó's Falls, Feb 1858, Schott 8 (\*F,NY); corregimiento de Truandó, orillas del Río Chintadó, a 3 km de su confluencia con el Truandó, mon. de. Ríosucio, 200 m, Oct 1956, Castañeda 6080 (NY); Río Truando, 18 May 1967, Duke 11129(2) (NY); Cupica, ca 50 m, 10 Feb 1947, Haught 5556 (MO).

P A N A M A. LOCALITY UNKNOWN: Sinclair s.n. (K); Mar 1905, Cowell 419 (NY); Panama or Colombia?, 1831, Cuming 1142 (GH,K-2 sh.; not B1); Cana and vic., 2000-6500 ft, 17 Apr-8 Jun 1908, Williams 755 (NY). DARIÉN: Mannene to mouth Río Cuasi, Kirkbride & Bristan 1402 (MO); Quebrada Sierra from Río Tuira to track of Chevy Expedition, between los Ríos Cube & Punusa, 27 Feb 1972, Gentry 4438 (MO); Lucuti, Chepigana Dist., 50 ft, 5 Mar 1940, Terry & Terry 1372 (A,F,MO). PANAMA: between Mt. Hope & Santa Rita Trail, 25 Feb 1905, Cowell 68 (NY) and 82 (NY); sabanas near Chepo, 30 m, 20 Jan 1935, Hunter & Allen

92 (G,M0). COLON: 10 mi SW of Puertobelo, 2-4 mi from coast, 10-200 m, 24 Mar 1973, Liesner 1084 (M0); near Salamanca, 8 mi E of Transisthmian Highway, 100 m, 19 Dec 1972, Gentry 6704 (M0); Peluca, ca 27 km from Transisthmian Highway on road to Nombre de Dios, trail to Río Boquerón & along bank, 25 Feb 1973, Kennedy 2642 (M0). CANAL ZONE: San José Island, East Harbor, 2 May 1945, Erlanson 35 (G,NY,US); East Point near Quarry of San José Island, Johnston 670 (GH-2 sh.,M0); Frijoli station, 6 Feb 1862, Hayes 492 (BM,E,K,M); l.c., 2 Feb 1971, Croat 13223 (M0); pipeline road, 2-4 mi N of Gamboa, 100 m, 15 Dec 1972, Gentry 6531 (M0); between Alhajuela & El Vigía, 12 Jan 1911, Pittier 2368 (US-frag.); Las Cascadas Plantation, 4 Jan 1924, Standley 29557 (US); W. arm of Quebrada Salamanca, 70 m, 16 Dec 1934, Dodge, Steyermark, & Allen 17007 (G-2 sh.,GH,M0); hills around Aqua Clara Reservoir near Gatun, 20-30 m, 5 Feb 1911, Pittier 2652 (F,NY,S,US). CANAL ZONE (BARRO COLORADO ISLAND): 1931, Aviles 85a (M0); Jan 1939, Brown 101 (F) and 136 (F); 15 Jan 1968, Duke 15039(2) (NY); 24 Jan 1968, Dwyer 8452 (GH,M0); 30 Jan 1929, Frost 82-1/2 (F); Jan 1930, Zetek 15002 (F-frag.); laboratory clearing, 10 Jan 1969, Croat 7077 (M0); l.c., 19 Sep 1973, Montgomery 74 (M0); above rock cliff at N end of laboratory clearing, 10 Jan 1969, Croat 7071 (M0); cove N of lab, 1 Feb 1932, Woodworth & Vestal 478 (F); shore N of lab, 2 Feb 1932, Woodworth & Vestal 347 (A,F); shore near lab, 5 Feb 1932, Woodworth & Vestal 735 (A,F); l.c., 15 Feb 1931, Wilson 23 (F,M0); shore near Gatun Lake, E of laboratories, 24 Nov 1943, Killip 40030 (M0-2 sh.,US); electric line clearing near dock, 10 Apr 1968, Croat 4615 (M0); E of dock, 3 Nov 1931, Shattuck 312 (F,M0); clearing N of dock, 6 Feb 1969, Croat 7732 (M0); N of boat dock, 6 May 1956, Stoutamire 2051 (\*MICH); shore cove W of

Drayton House, 16 Feb 1932, Woodworth & Vestal 598 (A,F); William Morton Wheeler Trail, 600 m, 31 Jul 1929, Wetmore & Woodworth 64 (A,F); l.c., 800 m, 20 Dec 1931, Wetmore & Abbe 6 (F,GH,M0); junction Fairchild, Wheeler, & Lathrop trails, 13 Feb 1969, Croat 7929 (M0); Lathrop trail, 130 m, 9 Mar 1969, Croat 8497 (M0); Tom Barbour Trail 1000, 25 yds S of trail along ridge, 10 Dec 1967, Croat 4216 (M0,NY); shoreline near end of Armour Trail, 28 Feb 1969, Croat 8239 (M0); Donato Trail near Lutz creek, 3 Apr 1970, Croat 9310 (\*M0); Zetek trail, 1600 m ca, 31 Jul 1929, Wetmore & Woodworth 71 (A,F); Van Tyne Trail, 6 Jan 1940, Hunnewell 16424 (\*GH); forest n of animal cages, 10 Jan 1969, Croat 7091 (\*M0); cliffs in straight at Fairchild Point, 16 Apr 1968, Croat 4853 (F,M0); steep rocky wall along Buena Vista Reach S of Fairchild Point, 1 Oct 1968, Croat 6605 (M0); steep slope on east Peña Blanca Point, 4 May 1968, Croat 5333 (M0-2 sh.); NE corner of S cove N of Burrunga Pt., 16 May 1968, Croat 5595 (M0); shoreline east side Peña Blanca Point across from front of #8 light, 5 Oct 1968, Croat 6734 (M0); forest edge of clearing near stream, 20 Mar 1970, Croat 8905 (M0); shore of 2nd point E of Peña Blanca, 23 Feb 1932, Woodworth & Vestal 675 (A,F,M0); between the station and Point Salud, 23 Dec 1963, Graham 204 (GH); NE corner of Orchid Island, 24 Apr 1968, Croat 5067 (M0); E edge of Orchid Isle, 18 Dec 1970, Croat 12847 (M0); SW corner small island at M Trail end, 19 Apr 1968, Croat 4967 (M0); corner small island near lights, on way to Pearson Trail, 8 Sep 1929, Bangham 599 (A,F); shoreline, large cove SW of Slothia Island, 19 Jan 1969, Croat 7340A (M0).

C O S T A R I C A. Boca Culebra, 50 m, 18-Jan 1898, Pittier 12342 (P). PUNTARENAS: ca 5 km W of Rincón de Osa, Osa Península,



50-200 m, 8°42'N-83°31'W, 9-12 Jan 1970, Burger & Liesner 7247 (F); Tinco Station, between Rio Esquinos & Palmar sur de Osa, sea level, 22 Dec 1950, Allen 5711 (FLAS); entre Parrita y Esterillos, 10 m, 30 Mar 1966, Jimenez 3901 (BM,F,GH).

19bb. Clitoria javitensis (H.B.K.) Benth. var. portobellensis (Beurl.) f. pilosa Fantz, f. nov.

Leaf pubescence on lower surface moderately densely pilose, becoming glabrate, trichomes then confined to major nerves spreading to suberect.

TYPE COLLECTION: PANAMA. Canal Zone: vic. of Gamboa, 20 Dec 1946, Allen 3931 (HOLOTYPE: G-26, hb. Delessert. Isotype: MO: 1572352).

DISTRIBUTION (Figure 47):

M A R T I N I Q U E. Introduce & cultivé, Tarnasse, 1883, Duss 1074 (NY); cult. Jardin Botanique, Fort de France, 22 Dec 1938, Stehlé 3533 (NY).

V E N E Z U E L A. MIRANDA: prope coloniam Tovar, 1856-7, Fendler 2201 (K). CARABOBO: between Valencia & Campanero, 2500 ft, 7-3-57, Anonymous (=Fendler ?) 2201 (K). YARACUY: del Río Guayabito, em El Guayabito Playón, 15 km N de Marin, 150-250 m, 28 Nov 1971, Steyermark & Bunting 105298 (VEN); cerca del Pueblo de Aroa, Mar 1959, Aristeguieta 3841 (US-2 sh.,VEN).

P A N A M A. LOCATION UNKNOWN: Panama, Cuming 1142 (BM; not GH, K); Sotto Caballo, 28 Dec 1957, Smith Jr., Smith, & Arrang 3319 (PH). DARIÉN: vic. of Pinas, 2 Mar 1967, Duke 10617 (MO); Río Sambú, 0-5 mi

above Río Venado, 18 Jan 1967, Duke 9262 (MO,NY,US); Garachiné, sea level, Jan-Feb 1912, Pittier 5513 (US). PANAMA: Isla del Ray, 28 Jan 1967, Duke 9529 (MO); Río Pasiga to above waterfall on 2nd main fork, 29 Oct 1971, Gentry 2279 (MO). COLON: Juan Mina Plantation, Río Chagres, region above Gamboa, 25 m, 3 Feb 1947, Allen 4114 (G,MO). CANAL ZONE: Gamboa road, 3-2-33, Jones 268 (US); between Summit & Gamboa, 20 Jan 1922, Greenman & Greenman 5239 (MO); Gamboa pipe line, on Tropic Test Center lands, 2 km S from main dirt road, 28 Nov 1967, Correa A. & Haines 481 (\*MO); vic. Gamboa, 20 Dec 1946, Allen 3931 (G, MO); around Gorgona, 15 Jan 1911, Guillard 2405 (US: on Pittier label); between Gorgona & Mamei, 10-30 m, Jan 1911, Pittier 2405 (GH,NY); Empire to Mandinga, 23 Feb 1923, Piper 5140 (US); Culebra, 50-150 m, 4 Jan 1911, Pittier 2231 (US); edge Chagres River near Gatun, Dec 1859, Hayes 679 (NY); Chiva-Chiva Trail, Red Tank to Pueblo Nuevo, 1 Mar 1923, Piper 5107 (US); Barro Colorado Island, shore in front of Fuertes House, 16 Jan 1932, Wetmore & Abbe 6A (GH-2 sh.,MO); Barro Colo. Is., shoreline N of 1st cove S of #8 Rear Light, 1 May 1968, Croate 5285 (MO-2 sh.). CANAL ZONE (SAN JOSE ISLAND): Guajaquil-viken, 1852, Andersson s.n. (S); Area 7C, S of Spring Ravine on Canyon Rd., 7 Feb 1946, Johnston 1351 (GH); Mareno Valley below Red Hill, 4 Apr 1945, Johnston 628 (GH); along M-area road, N half of island, 21 May 1945, Erlandson 177 (GH); airstrip, 24 Mar 1945, Johnston 538 (GH). CHIRIQUI: Corotu, 6 m SW of airport of Puerto Armuelles, 17 Feb 1973, Busey 399 (MO); Quebrada Manzanillo, 9 km S x SW of Puerto Armuelles, 3 Mar 1973, Busey 733 (MO).

19bc. Clitoria javitensis (H.B.K.) Benth. var. portobellensis  
(Beurl.) Fantz f. truncata Fantz, f. nov.

Leaves obovate, glabrate below, trichomes along nerves subappressed to spreading; leaflets 5-8 cm long, 4-5.5 cm wide, apex truncate to truncate-retuse, base cuneate.

TYPE COLLECTION: PANAMA. CANAL ZONE: Barro Colorado Island, Jan 1939, Brown 185 (HOLOTYPE: F 1004739).

This form is known only from the one collection. The leaf type is unknown elsewhere in the subgenus Bractearia, and only from the Asian species C. javanica (subgenus Neurocarpum) and from a couple of leaflets of a C. kaessneri specimen (subgenus Clitoria) from central Africa.

19c. Clitoria javitensis (H.B.K.) Benth. var. longiloba Fantz,  
var. nov.

Leaves glabrate to glabrous on lower surface, trichomes, when present, sparse, subappressed, confined to nerves; leaflets typically small or becoming broadened, 7-14 (19) cm long, 4.5-9 (12) cm wide. Petioles short, 3-9 cm. Petiolule 4-6 mm, rarely 9-10 mm on larger leaflets. Stipules deciduous, usually not observed, (4) 5-7 mm. Inflorescences few-flowered, short, 0.5-2 cm. Pedicels 5-7 mm. Bracts small, 3-4 mm. Bracteoles small, 3-4 (rarely 5) mm, subtending calyx base and inserted 1-2 mm below it. Calyx lobes elongate, length nearly twice the width, apex short-acuminate to subulate, (5) 6-8 (9) mm long. Stipe unknown.

TYPE COLLECTION: PERU. Loreto: Stromgebiet des Marañón von Iquitos aufwärts bis zur Santiago-Mundang am Pongo de Manseriche, ca 77°30'W, 1924, Tessmann 3782 (HOLOTYPE: S. Isotypes: G-193 & 194, herb. Delessert. Cotype: F 612407).

DISTRIBUTION (Figure 46): This variety is an apparent endemic to Loreto, Peru, collected in forests at elevations of 100-220 m.

P E R U. LORETO: Iquitos and vic., 120 m, 12 Oct 1929, Williams 3691 (F); Mishuyacu, near Iquitos, 100 m, Oct-Nov 1929, Klug 464 (F, NY); Stromgebiet des Marañón von Iquitos, 1924, Tessman 5347 (G); Balsapuerto, 220 m, May 1933, Klug 3044 (A,BM,F,G,GH,MO,NY,S); between Yurimaguas & Balsapuerto, lower Río Huallaga basin, 135-150 m, 26-31 Aug 1929, Killip & Smith 28104 (NY) and 28235 (NY).

19d. Clitoria javitensis (H.B.K.) Benth. var. grandifolia

(Ducke) Fantz, comb. nov.

Clitoria grandifolia Ducke, Arch. Jard. Bot. Rio de Jan.

5: 141. 1930.

Leaflets typically grandifoliate, large, typically (10) 15-28 cm long, 6-15 cm wide. Petiole elongate, 10-25 cm. Petiolule long, 6-10 mm. Stipules long, 6-10 mm. Inflorescence elongate, 4-18 cm, multiflowered. Pedicels typically 5-9 (11) mm. Bracts short, 3-4 (5) mm. Bracteoles long, 4-6 mm. Calyx lobes elongate, (4) 5-8 mm, ventral lobe 7-12 mm. Stipe short, 19-24 mm.

TYPE COLLECTION: BRAZIL. Amazonas: Tonantins, 8 Nov 1927, Ducke 20399 (LECTOTYPE: RB-2 sheets).

Ducke cited three collections he had examined from the herbarium at the Jardim Botânico de Rio de Janeiro. Each collection is mounted on two sheets placed in separate folders. Of the three collections, Ducke 20400 lacked the fruits which were described in the original description of C. grandifolia. The Kuhlmann 1493 specimen lacked any matured flowers. The remaining collection (Ducke 20399) has a matured fruit, a bifurcate inflorescence of many flowers, and a packet of fruit fragments, an intact flower, and a dissected flower. The best specimen which matches the description published by Ducke, Ducke 20399, and thus it is selected as the lectotype. The other two collections cited by Ducke are selected as lectoparatypes for the variety.

DISTRIBUTION (Figure 46): This variety is distributed in the Western Amazon Basin at elevations recorded as (based on Colombia collections) ca 100-500 m.

V E N E Z U E L A. AMAZONAS: Río Cunucununa, 9 Nov 1950, Maguire, Cowan, & Hurdack 29412-A (NY,VEN); vic. base camp, Cerro Sipapo (Paraque), 30 Dec 1948, Maguire & Politi 28044 (BM,NY,US,VEN).

B R A Z I L. camp de Dr. Vieiralves, Manaus, 20-o-56, Chagas 3350 (US); Benjamin Constant, alto Solimoes, 7 Sep 1962, Duarte 6936 (NY, RB-2 sh.); Sao Paulo de Olivenca, 18 Oct 1927, Ducke 20400 (LECTO-PARATYPE: RB-2 sh. Isolectoparatypes: S,U)

C O L O M B I A. PUTUMAYO: del Río Putumayo en Puerto Ospina, 230 m, 24 Nov 1940, Cuatrecasas 10779 (US). META: Monte, .25 km E Puerto López, 200 m, 5 Feb 1944, Hermann 11208 (NY,US); Ladorada Marayal de San Martín, 16 km NW San Martín, 400 m, 3 Feb 1944, Hermann 11172 (F,GH,MO,NY-2 sh.,US); ca 20 km SE of Villavicencio, 500 m,

17 Mar 1939, Killip 34304 (US-2 sh.); sabanas San Juan de Arana, Río Guejar, alrededores del aterrezaje "Las Micas," 500 m, 22 Jan 1951, Idrobo & Schultes 1211 (GH,U); Sierra de la Macarena, Caño Entrada, 500 m, 13 Dec 1949, Philipson, Idrobo, & Fernandez 1739 (BM,F,US): Río Guapaya, Sierra de la Macarena, 450 m, 7 Dec 1949, Philipson, Idrobo, & Fernandez 1720 (BM,US).

P E R U. Iquitos, 26 Feb 1924, Kuhlmann 1493 (LECTOPARATYPE: RB-2 sh. Isolectoparatype: U; non S = Canavalia dictyota).

19e. Clitoria javitensis (H.B.K.) Benth. var. klugii Fantz,  
var. nov.

Leaflets typically small, 11-18 cm long, 6-10 cm wide. Petioles elongate, 10-19 cm. Petiolules short, 4-6 mm. Stipules long, 5-7 mm; inflorescence elongate, multi-flowered, 8.5-19 cm. Bracts small, 2-4 mm. Pedicels 7-9 mm. Bracteoles 3-5 mm long, subtending the base. Calyx lobes elongate, 5-7 (8) mm. Ovary pubescence white, tinged yellowish. Stipe not observed. Tree (?).

TYPE COLLECTION: PERU. Loreto: tree 4 m tall, fls. dark lilac, Mishuyacu, near Iquitos, forests, 100 m, Oct-Nov 1929, Klug 173 (HOLOTYPE: US 1455172. Isotypes: F 624041, NY).

DISTRIBUTION (Figure 46); This variety is known only from the type locality.

P E R U. LORETO: Mishuyacu, near Iquitos, 100 m, Oct-Nov 1929, Klug 39 (PARATYPES: F 623967, NY).

20. Clitoria cavalcantei Fantz, sp. nov.

Liana. Branches 2-4 mm diameter, pith hollow, subquadrangular becoming terete, pubescence of juvenile branches uncinata becoming glabrate; bark dark brown, splitting initially longitudinally at angles, light-colored beneath; axillary buds 2.5-3.5 mm, scales ovate, sparsely strigose, inner scales ciliate. Leaves 3-foliate, coriaceous, concolorous to slightly darker above, leaflets elliptic to elliptic-oblong, rarely obovate, apex acuminate, acumen 1-2.5 cm long, more or less mucronate, 2-6 mm wide, straight to arcuate, base broadly cuneate, midrib subimpressed above, primary nerves of 7-9 pair, upper surface glabrous, lower surface glabrous or rarely with a few subappressed trichomes on nerves, lamina 10-17 cm long, 5-9 mm wide. Petiole dark brown, subterete, 3-6 cm long; swollen base 6-7 mm, pubescence uncinata; rachis 2-2.5 cm. Petiolules quadrangular-subterete, rugose, glabrate, 5-6 mm. Stipules deciduous, lanceolate-ovate, acute, sparsely pubescent, 5-6 mm long, 2 mm wide; stipels more or less persistent, linear, acute glabrate, 3-6 mm long, 1 mm wide. Inflorescence axillary and cauliflorous, few-flowered (4-8 flowers), racemose, more or less nodose, solitary or paired at node, 0.5-1.5 cm long, axis pubescence uncinata with moderately dense, falcate-spreading trichomes. Pedicels 5-8 mm, pilose. Bracts ovate, acute, strigose, more or less ciliolate, middle pair 3-5 mm long, 1-1.5 mm wide, outer bract 2-3 mm long, 0.5 mm wide. Bracteoles lanceolate-ovate, acute, 5-7 mm long, 1-2 mm wide, subtending the base and inserted 1 (2) mm below it, pubescence moderately dense, appressed, ciliolate. Flowers large, (5.5) 6-7 cm, rose-colored, turning purplish. Calyx pubescence appressed, thinned, uncinata

trichomes not observed (typically found in other species), tube 16-20 mm long, 5-9 mm wide at base to 8-11 mm at throat, lobes deltoid-ovate, acuminate, often broad-angled sinus (nearly 90°) between lateral and dorsal teeth, 5-8 mm long, 3.5-5 mm wide, ventral lobe 7-10 mm.

Vexillum pubescence conspicuously uncinata toward apex and margins, appressed trichomes moderate, more or less confined to veins, blade 3.5-4 cm wide, claw 14-18 mm. Alae extended beyond carina 6-11 mm, blade 22-27 mm long, 4-7 mm wide, claw 17-22 mm. Carina falcate, 11-13 mm long, 4-5 mm wide, claw 27-29 mm. Stamens diadelphous, vexillary stamen coherent near base, staminal tube nearly straight, 39-46 cm long, free filaments 2-5 mm; anthers lanceolate, 1.6-2.4 mm long, 0.5-0.7 mm wide. Gynophore black, suberect, 3-6 mm; pubescence of uncinata with scattered white trichomes; ovary 12-16 mm long, 1 mm wide; pubescence white, sericeous, hiding uncinata trichomes beneath; style dark-colored, 24-32 mm long, geniculate 7-10 mm from distal end. Legume unknown except in juvenile state (ca 9.5 x 0.6-0.7 cm) flat, swollen around seeds; densely uncinata pubescent with scattered suberect trichomes; stipe 19 mm. Seeds unknown, ca 9 per pod. Figure 48.

Cavalcante's Clitoria is characterized as a liana with glabrous leaves and short inflorescences which bear large, reddish-purple flowers from an appressed pubescent calyx, and later bearing uncinata pubescent legumes.

PHENOLOGY: Flowers have been collected from mid-July to October and mid-February to March 1. The only juvenile fruit seen was collected in early March.

TYPE COLLECTION: BRAZIL. Pará: Cipó lenhoso, flor na antea, rósea depois roxo, mata devastada, comum, Parque Ingigena do Tumucumaque,



Figure 48. *Clitoria cavalcantei*. (a-b) leaflets, x 1; (c) inflorescence, x 1; (d) flower, x 1; (e) vexillum, x 1; (f) ala and carina, x 1; (g) gynoeceum, x 1; (h) androeceum, x 1; (i) calyx, x 1; (j) juvenile fruit, x 1. (Cavalcante 2570, NY: b-c,g-j. Spruce 1877, K: a,e-f. Ducke 23406, S: d.)



Rio Par  de Oeste, Miss o Tiriyo, arredores da Miss o, 2 20'N-55 45'W, 1 Mar 1970, Cavalcante 2570 (HOLOTYPE: NY. Isotypes: F 1717517,S,U 256619B).

The specimen selected as the holotype is the only specimen which has the juvenile fruit and its characteristic uncinat  pubescence which segregates this species from C. javitensis. The packet also contains parts of at least two dissected flowers. Spruce 1877 has been cited for C. javitensis, but the dissected flower with the characteristic white pubescent ovary and uncinat  gynophore agree with Cavalcante 2570. Spruce 1877 has larger flowers and leaves than the less mature holotype. It has been selected as a paratype.

NOTES: Clitoria cavalcantei has close affinities with C. javitensis which it superficially resembles. However, it differs from it by the uncinat  pubescent fruit, a style much longer than the ovary, and a white pubescent ovary which bears uncinat  trichomes beneath the sericeous trichomes. These characteristics are common in most of the species of section Cauliflorae found in the eastern part of northern South America. However, these species have conspicuously uncinat  calices, unlike C. cavalcantei which has appressed trichomes and lacks any uncinat  trichomes on the calyx.

Identification of C. cavalcantei from C. javitensis var. javitensis may cause some difficulty where specimens from the Amazon basin are involved because the distribution of the two species overlap. Other varieties of C. javitensis are excluded from the discussion because of their elongated inflorescences or because of their range of distribution is far removed from C. cavalcantei. Clitoria javitensis specimens from the Amazon basin typically have minute bracteoles (2-4 mm long), more

elongated inflorescences (1-6 cm), short calyx lobes (4-6 mm) rufus pubescent to tawny ovaries, styles subequalling the ovary, and vexillum pubescence conspicuously appressed. The leaflets have more nerves (9-12 primary pairs), and appressed trichomes below, at least along the nerves, and shorter stipules (3-5 mm). Clitoria cavalcantei specimens have longer bracteoles (5-7 mm), shorter inflorescences (0.5-1.5 cm), longer calyx lobes (5-8 mm), ovaries with white pubescence and gynophores with uncinata pubescence, styles much longer than the ovary, and a more conspicuously uncinata pubescence on the vexillum with the appressed trichomes congregated along the nerves and less dense. The leaflets have fewer primary nerves (7-9 pair), a lack of pubescence, and longer stipules (5-6 mm).

DISTRIBUTION (Figure 43): This species is found in the forests of the Amazon Basin in Brazil. Elevations for collections have not been reported.

B R A Z I L. AMAZONAS: Rio Negro, Sapó, Oct 1851, Spruce 1877 (PARATYPE: K-407, hb. Bentham); alto Rio Negro acimedo afflu. Curicuriary, logar Tucaby, 19 Nov 1929, Ducke 23704 (RB); Manaós, 14 Jul 1929, Ducke 23406 (G,K,RB,S,US): l.c., loco Cachseira Grande, 2 Feb 1946, Ducke 2029 (A,VEN). PARÁ: Santarém, 35 km da estrada do Palhão, arredores do Acompanhamento do Igarapé Curupira, 24 Aug 1969, Silva & Sonza 2379 (F,NY,S,U).

21. Clitoria coriacea Schery, Fieldiana Bot. 28: 260. 1952.

Clitoria certifera Cowan, Mem. N.Y. Bot. Gard. 9: 349. 1957.

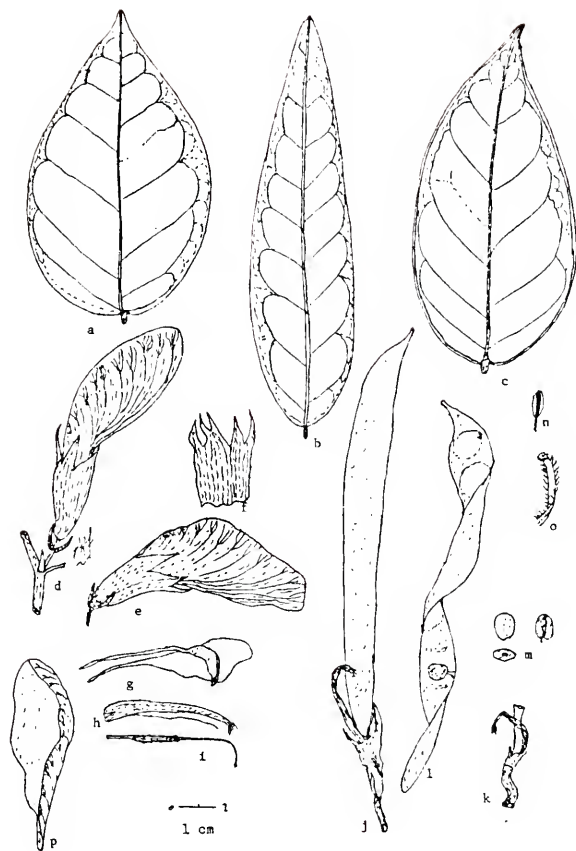
Clitoria emarginata Killip & Pittier, nom. in sched.

Virgate shrub, 1.5-2.5 m tall. Branches 3-7 mm diameter, pith hollow, internodes 2-10 cm, somewhat straight to slightly zigzag, juvenile branches quadrangular, pubescence uncinata and strigose, branches becoming subterete with uncinata pubescence to glabrate; axillary buds 3 mm, scales ovate, acute, strigose; bark dark gray, splitting infrequently in longitudinal slits, light-colored beneath.

Leaves 3-foliate, coriaceous, leaflets sometimes complicate, lanceolate, ovate-lanceolate to oblong-lanceolate, apex short-acuminate, acumen to 0.5 (1) cm long, 0.4-0.8 cm wide, more or less mucronate, base rotund to weakly cordate, or subtruncate, margins conspicuously revolute, midrib impressed above, primary nerves of 6-9 pairs, upper surface dark green, glabrous, lower surface ceriferous, pale yellow-green to olive-green, becoming green with age, lamina 5-13 cm long, (2) 2.5-5 (6) cm wide. Petioles subquadrangular, moderately strigose, 1.5-6 cm; rachis 1-2.5 cm. Petiolules subquadrangular, dark-colored, rugose, 2-4 mm, strigose pubescent to glabrate. Stipules persistent, lanceolate, acute to short-acuminate, 3-6 mm long, 1.5-3 mm wide, pubescence appressed; stipels linear-lanceolate, apex long-tapered to a point or short-acuminate, rigid, 2-5 mm long, 1-1.5 mm wide. Inflorescence axillary and at defoliated nodes, racemose, subsessile to 0.5 cm long, few-flowered (2-6 flowers), axis pubescence uncinata and falcate, rufus. Pedicels 5-9 mm, pubescence falcate, rufus, and uncinata, moderate to dense. Bracts lanceolate, acuminate, pubescence subappressed, middle pair persistent, 2.5-5 mm long, 1-2.5 mm wide, outer bract deciduous, 2-3.5 mm long, 1-2 mm wide. Bracteoles persistent, lanceolate, 5-8 (11) mm long, 1-2 mm wide, inserted 2-3 mm below the base, pubescence uncinata and falcate, rufus, scattered. Flowers pale lilac to purple,

vexillum basally with fine red veins, 4-6 cm long. Calyx pubescence conspicuously uncinata with moderately scattered, falcate, rufous trichomes, tube 13-17 mm long, 4-6 mm wide at base to 9-11 mm wide at throat, lobes deltoid-lanceolate, acuminate, with a broad-angled sinus (nearly 90°) between the lateral and dorsal teeth, 7-12 mm long, 2.5-4 mm wide, ventral lobe narrow lanceolate to linear, 10-14 mm long, 1-1.5 mm wide. Vexillum pubescence uncinata and sparsely pilose, often the macrotrichomes confined to nerves, blade 2.5-4.5 cm wide, claw 9-12 mm. Alae extended beyond carina 4-7 mm, white, blade oblong, weakly falcate, 18-26 mm long, 5-9 mm wide, claw 13-19 mm, uncinata pubescent. Carina white, falcate, blade 11-16 mm long, 4-6 mm wide, claw 23-30 mm, with uncinata trichomes. Stamens diadelphous, vexillary stamen coherent near base, tube 33-39 mm long, free filaments 2-4 mm; anthers lanceolate, 1.5-2 mm long, 0.5-0.7 mm wide, connective acute. Gynophore 5-8 mm; pilose pubescent; ovary 11-15 mm long, 1-1.3 mm wide, pubescence dense, tawny-sericeous; style 23-27 mm, geniculate 7-10 mm from distal end; stigma flattened, subcapitate, 1 mm diameter; ovules 15 (vide Cowan, 1957). Legume flat, upcurved at apex, greenish-brown, pubescence conspicuously uncinata with scattered suberect trichomes, base enclosed within calyx lobes, valves 6-12 cm long, 9-15 mm wide; stipe enclosed within calyx tube, 16-20 mm long, 2-3 mm wide expanding to 4-5 mm at apex, pubescence dense, of uncinata and suberect trichomes; beak 5-10 mm; dehiscence causing valves to twist one to one and one-quarter of a turn. Seeds light to dark brown, smooth, weakly lenticular, face suborbicular to slightly longer than broad, 6-8 mm long, 5-7.5 mm wide, 3 mm thick, 8-11 seeds per pod; hilum oblong, 1.5 mm x 1 mm. Figure 49.

Figure 49. Clitoria coriacea. (a-c) leaflets, x 1; (d) inflorescence, x 1; (e) flower, x 1; (f) calyx, x 1; (g) ala & carina, x 1; (h) androecium, x 1; (i) gynoecium, x 1; (j) immature fruit, x 1; (k) stipe, x 1; (l) dehisced fruit, x 1; (m) three views of seed, x 1; (n) anther, x 4; (o) upper style, x 3, (p) vexillum, x 1. (Maguire et al. 37635, NY: c-i, n-p, Williams 15047, F: a. Maguire et al. 37580, VEN: b. Maguire et al. 41666, US: j-l).





The wax bearing Clitoria is characterized as a virgate shrub having leaves ceriferous below and with conspicuous revolute margins, subsessile inflorescences of few, medium-sized, lilac-purplish flowers, and small legumes.

PHENOLOGY: Flowers have been collected in February, April, and May. The only collection of the fruit was made in early October.

TYPE COLLECTION: VENEZUELA. Amazonas: Arbusto trepador, flores púrpuras o de color de malva, en la Sabana Abierta, San Antonio, upper Río Orinoco, 121 m, 27 Apr 1942, Llewelyn Williams 15047 (HOLOTYPE: F 1189036. Isotypes: US 1834849, VEN 25808).

Cowan's name (C. cerifera) employs an appropriate epithet for the only wax-bearing species known, although Schery's name has priority and is the correct name. Cowan was unaware of the publication by Schery, as Cowan had identified the Smithsonian isotype of C. coriacea using his name of C. cerifera. The Venezuelan isotype (Williams 15047, VEN 25808) is the type specimen for the unpublished name, C. emarginata Killip & Pittier. This specimen was annotated to "C. coriacea Schery, n. sp. Tipo." The discovery of a published name for the specimen may be the reason why Killip & Smith did not publish their name.

There are two types for the synonym C. cerifera. Cowan selected the holotype specimen as Maguire, Wurdack, & Bunting 37580 (NY). Maguire, Wurdack, & Bunting 37635 was selected as the paratype. Both collections represent younger leaves than Schery's type. The type of C. coriacea has lost most of the wax from the lower leaf surface and the leaflets have become darker in color.

NOTES: Schery correctly noted that the species had affinities to C. javitensis, whereas Cowan placed the species near C. arborescens.

Clitoria coriacea differs from both species by its subsessile inflorescences, a style much longer than the ovary, smaller legumes, and a conspicuously uncinatè pubescent calyx. Leaves of Clitoria coriacea are similar to these two species with the leaflet midrib impressed above, and more similar to those of C. javitensis in shape. However, C. coriacea is much more closely related to C. sagotii based upon the subsessile inflorescence, fruit pubescence (predominately uncinatè), the appearance of the calyx (longer lobes and broader sinus between lateral and dorsal lobes), and the reproductive structures, although it clearly differs vegetatively from C. sagotii by the revolute margins, ceriferous lower surface, and lack of a raised midrib.

The smaller leaflets, smaller fruits, and habitat are similar to some members of the subgenus Neurocarpum. The leaflets and fruits of C. coriacea are the smallest found in the subgenus Bractearia.

DISTRIBUTION (Figure 43): This species is found in the drier parts of savannas in the Amazonas territory of Venezuela at elevations of 100-140 m.

V E N E Z U E L A. AMAZONAS: right bank Río Pacimoni, 50 km above mouth, 7 Feb 1954, Maguire, Wurdack, & Bunting 37580 (Type of synonym C. cerifera: F,GH,NY-2 sh., holotype, RB,VEN); l.c., 100-140 m, 2 Oct 1957, Maguire, Wurdack, & Bunting 41666 (F,G,GH,NY,RB,S,US,VEN); left bank Caño Hechimoni, 8 km above mouth, 100-130 m, 9 Feb 1954, Maguire, Wurdack, & Bunting 37635 (F,NY); along Río Cotua W of campsite, Cerro Yapacana, between El Campamento base & Sabana Grande, 3°45'N-66°45'W, 125 m, 7 May 1970, Steyermark & Bunting 103270 (VEN) and 103272 (VEN).

22. Clitoria tunuhiensis Fantz, sp. nov.

Trailing liana. Branch 2-3 mm diameter, pith solid, with pubescence dense, puberulent, rufus, becoming whitened with age. Leaves 3-foliate, thick membranous, leaflets ovate to ovate-elliptic, apex short-acuminate, acumen to 0.5 cm long, 3-6 mm wide, more or less mucronate, base rotund, midrib subraised above, pilose, rufus, moderately dense, primary nerves of 7-9 pair, upper surface dark green, glabrous, lower surface reddish-green, tomentose, trichomes rufus, lamina 6.5-9.5 cm long, 4-5.5 cm wide. Petioles subterete, 2-3 cm puberulent, rufus; rachis 1.5-2.5 cm. Petiolules subquadrangular, 4-5 mm, puberulent, rufus. Stipules lanceolate, acute, 4-5 mm long, 2 mm wide; pubescence ciliate and strigose, densest towards apex, trichomes rufus; stipels linear, acute, 3-4 mm long, 0.5-1 mm wide, pubescence uncinata. Inflorescence axillary, solitary, racemose, few-flowered (2-4 flowered), subsessile to 0.8 cm long, axis pubescence dense, puberulent, trichomes rufus. Pedicels 5-7 mm. Bracts lanceolate, acute, 5-7 mm long, 1.5-2 mm wide, pubescence uncinata, pilose, more or less ciliate. Bracteoles lanceolate, acuminate, 13-14 mm long, 2.5-3 mm wide, inserted 2-3 mm below the calyx base, pubescence densely uncinata and scattered-pilose, ciliate. Flowers medium-sized, ca 4.5 cm (slightly immature), color unknown. Calyx pubescence moderately dense, conspicuously pilose and uncinata, tube 15-17 mm long, dark-colored (violet-tinged ?), 4-5 mm wide at base to 7-9 mm wide at the throat, lobes lanceolate, acuminate, 9-11 mm long, 3-4 mm wide, ventral lobe linear, 10-12 mm long, 1 mm wide, arcuate towards apex. Vexillum pubescence appressed, tawny, blade ca 2.5 cm wide, claw 6 mm. Alae

extended beyond carina 4 mm, blade spatulate, 20 mm long, 4-6 mm wide, claw 13 mm. Carina falcate, 12 mm long, 4 mm wide, claw 21 mm. Stamens diadelphous, vexillary stamen coherent near base, tube glabrous, 28 mm long, incurved abruptly at apex ca 2 mm, free filaments 2-4 mm; anthers lanceolate, 2 mm long, 0.7-0.8 mm wide, connective acute. Gynophore 4-5 mm; pubescence near apex yellowish-white; ovary 10 mm long, 1.2 mm wide; pubescence white, tinged yellowish; style 21 mm long, geniculate 5-6 mm from distal end, with a dense beard, sericeous towards base; stigma flattened, subcapitate, puberulent around base, ca 0.75 mm diameter. Legume unknown. Figure 50.

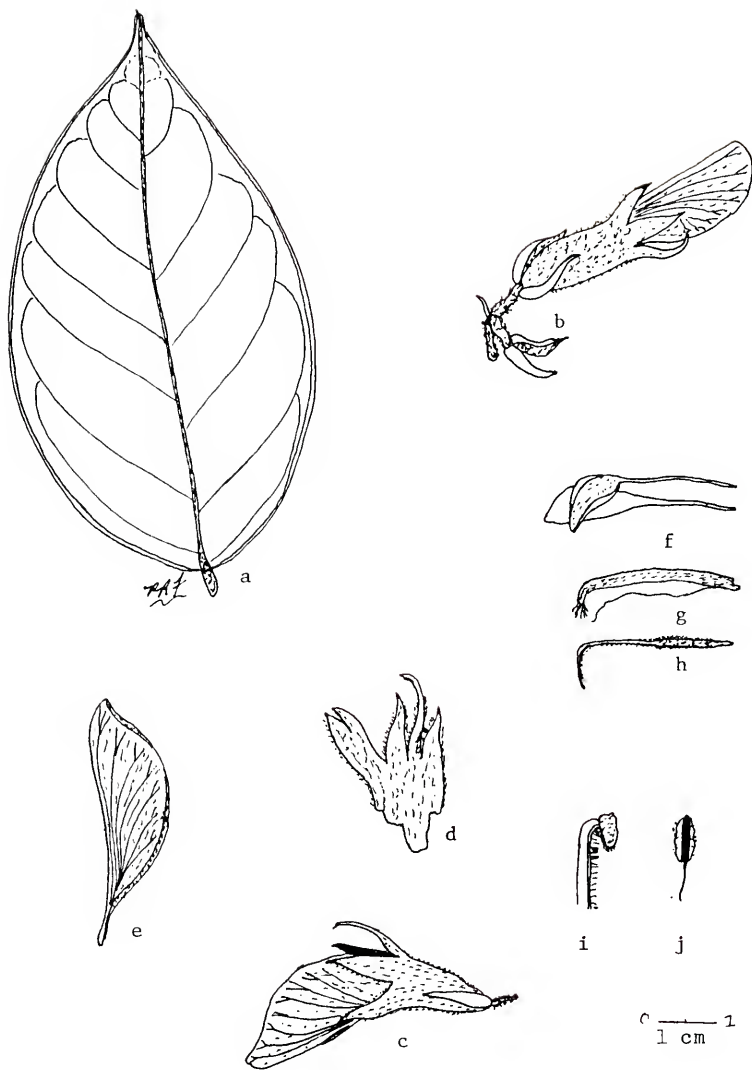
The Tunuhy Clitoria is characterized as a woody vine with ovate leaflets, revolute margins, and tomentose below, and bearing short, subsessile inflorescences of medium-sized flowers that have a pilose-uncinate pubescent calyx with elongate lobes and bracteoles.

TYPE COLLECTION: BRAZIL. Amazonas: Vine or bare (?), Rio Negro, Icana, Serra de Tunuhy, 5 May 1947, Fróes 22274 (HOLOTYPE: U 95456A).

PHENOLOGY: The only collection of flowers was made in early May.

NOTES: Clitoria tunuhiensis has close affinities with C. coriacea, both of which have similar appearances to the flowers, inflorescence, and leaves. Both species have revolute leaf margins, an uncommon characteristic in the genus. Clitoria tunuhiensis is easily distinguished from C. coriacea by the tomentose pubescence and the lack of wax on the lower surface of the leaves, the longer bracteoles, the shorter staminal tube and a denser pubescence of the vexillum. Clitoria tunuhiensis also appears similar to C. arborescens which differs by the elongate inflorescence, appressed pubescent calyx, and a style subequaling the ovary length.

Figure 50. Clitoria tunuhiensis. (a) leaflet, x 1; (b) inflorescence, x 1; (c) flower, x 1; (d) calyx, x 1; (e) vexillum, x 1; (f) ala and carina, x 1; (g) androecium, x 1; (h) gynoecium, x 1; (i) style apex and stigma, x 8; (j) anther, x 4. (Froes 22274, U 95456A).



DISTRIBUTION (Figure 43): This species is known only from the type collection.

23. Clitoria sagotii Fantz, sp. nov.

Clitoria javitensis (H.B.K.) Benth. (p.p. sensu Bentham),

Journ. Linn. Soc. 2: 42. 1858; non Neurocarpum

javitense H.B.K., Nov. Gen. Sp. 6: 409. 1823.

Clitoria javitensis (H.B.K.) Benth. var. glabra Sagot, Ann.

Sc. Nat. Ser. 6, 13: 299. 1882.

Clitoria javitensis (H.B.K.) Benth. var. guianensis Sagot,

nom. in sched.

Clitoria prostrata Spruce, nom. in sched.

Liana, climbing or occasionally trailing. Branches 3-17 mm diameter, pith solid, juvenile branches subquadrangular, with pubescence uncinata, branches becoming terete, glabrate; bark brownish on juvenile branches becoming grayish, nearly smooth to rough texture, splitting in longitudinal strips. Leaves 3-foliate, coriaceous, concolorous (green) to slightly light green below, leaflets basically elliptic-oblong or elliptic to lanceolate, narrow to very broad, apex nearly obtuse with moderately abrupt, acuminate tip, acumen 1-2 cm long, 2-7 mm wide, more or less mucronate, base cuneate to broadly cuneate, midrib conspicuously raised above, primary nerves of 6-11 pair, upper and lower surfaces glabrous, lamina (6.5) 8-21 (25) cm long, 3-8 (13) cm wide. Petiole subquadrangular-terete, adaxially truncate to caniculate, 1.5-8.5 cm, pubescence uncinata to glabrate; rachis 1.5-4 cm. Petiolule quadrangular, dark-colored, rugose, 4-9 mm, pubescence sparse, uncinata

with scattered white trichomes, to glabrate. Stipules deciduous, deltoid-lanceolate, acute, 4-5 (6) mm long, 1.5-2 mm wide; pubescence uncinata and more or less appressed; stipels somewhat persistent, linear to lanceolate, acute, 1-6 mm long, 1-1.5 mm wide, pubescence of uncinata and more or less appressed trichomes. Inflorescence axillary, solitary, or cauliflorous, fascicled, racemose, few-flowered (2-4 flowered, rarely 6-flowered), subsessile to 0.5 mm long; axis pubescence uncinata. Pedicels 6-11 mm, uncinata pubescent; pedicels of cauliflorous inflorescences compressed, flattened below the bracteoles, 2-3 mm wide. Bracts ovate, obtuse, pubescence uncinata and more or less minutely ciliolate; inner pair caducous; middle pair persistent, 3-5 mm long, 2 mm wide; outer pair deciduous, 1.5-3 mm long, 1-1.5 mm wide. Bracteoles linear-lanceolate, acute to short-acuminate, often spreading, 4-11 mm long, 1-2 mm wide, inserted 2-5 mm below the calyx base, uncinata pubescent. Flowers odorous, 5-8 cm, vexillum pinkish-mauve with darker-colored veins near center, alae and carina white. Calyx chartaceous, pubescence conspicuously uncinata (vide 20 x) with scattered subappressed to spreading trichomes, tube 11-16 mm long, 4-7 mm wide at base to 8-13 mm wide at the throat, lobes deltoid-ovate to lanceolate, acuminate, more or less arcuate, 5-13 mm long, 2-6 mm wide at base, ventral lobe 8-14 mm long, 1-2 mm wide. Vexillum pubescence uncinata with scattered appressed trichomes, blade 3-4.5 cm wide, claw 6-9 mm. Alae extended well beyond carina by 8-13 mm, blade spatulate-falcate, 18-23 mm long, 8-12 mm wide, claw 17-26 mm. Carina nearly straight, uncinata pubescent, blade 11-18 mm long, 3-6 mm wide, claw 25-35 mm. Stamens diadelphous, vexillary stamen coherent at the very base, tube glabrous, arcuate-falcate, 32-39 mm long, free filaments 4-7 mm; anthers



lanceolate, 1.5-2.1 mm long, 0.7-0.8 mm wide, connective acute, subequal to slightly shorter than pollen sacs. Gynophore 2-4 mm; ovary 10-15 mm long, 1-1.3 mm wide; pubescence white, tinged yellowish; style dark-colored, 22-26 mm, geniculate 8-10 mm from distal end; stigma dark-colored, capitate, 0.6-0.8 mm diameter. Legume (known from var. caniculata only) exerted above calyx, flat, pubescence more prominent along sutures, moderate, of uncinat trichomes with few, scattered, suberect, white trichomes, valves 8.5-15 cm long, 15-18 mm wide; stipe straight to weakly arcuate, 1.5 mm thick expanding to 3-4 mm at apex, 27-35 mm long, pubescence uncinat and pilose; beak when persistent, 10-15 mm; dehiscence causing valves to twist 1-2 turns. Seeds (observed in damaged condition) dark brown to black, smooth, thick lenticular to subglobular, 6-7 mm long, 6-8 mm wide, 4-5 mm thick, 4-8 seeds per pod. Figures 51 and 52.

Sagot's Clitoria is characterized as a liana with glabrous leaves and subsessile inflorescences bearing large, pinkish-mauve flowers from an uncinat pubescent calyx, or bearing uncinat pubescent legumes slightly exerted beyond the calyx.

PHENOLOGY: Flowers are collected from July through March with a peak during November to February. Fruits have been collected from November to February, and in July.

TYPE COLLECTION: FRENCH GUIANA. Frutex alte scandens, flores rosei, suaveolentes, plurimi e ligno prodientes (?), fructum non vidi, Karouany, 1857, Sagot 120 (HOLOTYPE: K-26, hb. Benth.; S= photo of K. Isotypes: GH,NY,S,U 37632A,W).

Sagot 120 is also the type for two other names, C. javitensis (H.B.K.) Benth. var. guianensis Sagot, nom. in sched., and

Figure 51. Clitoria sagotii - I. Var. sagotii: (a) leaflet, x 1; (b) inflorescence, x 1; (c) flower, x 1; (d) calyx, x 1; (e) vexillum, x 1; (f) ala and carina, x 1; (g) androecium, x 1; (h) gynoecium, x 1; (i) anther, x 4; (j) petiole and rachis, x 1; (k) cross-section of petiole, x 2. (Sagot 120, K-hb. Benthani: a-c,j-k. Cowan 38706, F 1446355: d-i.)

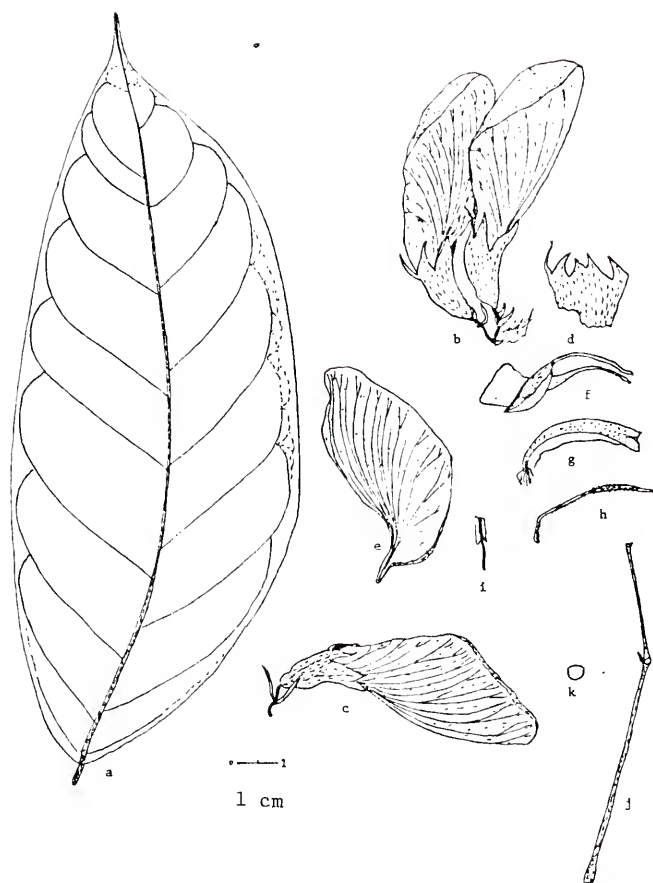
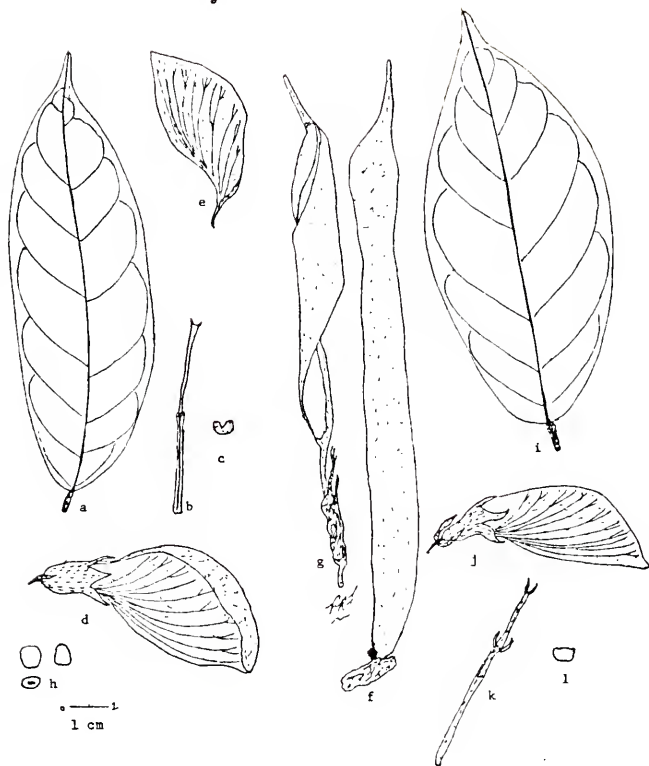


Figure 52. Clitoria sagotii - II. Var. caniculata: (a) leaflet, x 1; (b) caniculate petiole, x 1; (c) x-section petiole, x 2; (d) flower, x 1; (e) vexillum, x 1; (f-g) legume, x 1; (h) three views of seed, x 1. Var. sprucei: (i) leaflet, x 1; (j) flower, x 1; (k) petiole and rachis, x 1; (l) x-section petiole, x 2. (Forest Dept. Br. Guiana 3933, K-413: a-c; NY 2689: f,h. Cruz 1642, GH: g. Lang & Persaud 67, F 559005: d-e. Spruce 3543, K-433: i-l.)



C. javitensis (H.B.K.) Benth. var. glabra Sagot (1882). Sagot annotated the specimens with one varietal name, and later published the variety under a second name. He did not select a holotype. In recognizing this group as a species, Sagot's published varietal name was rejected as a specific epithet because of the possible confusion with the name C. glaberrima. Sagot's unpublished name was also rejected because it would become a homonym of C. guianensis (Aublet) Benth. Each specimen of this collection examined is nearly equivalent in the vegetative material and flowers it possesses. The Kew specimen is the only one which has the complete label data, part of which was cited by Sagot. The Kew specimen is selected as holotype for the new species.

VERNACULAR NAMES: SURINAM (MAROWIJNE): Kwatta Kamra, Jonker-Verhoef & Jonker 359 (mixed collection with fruits non-Clitoria). GUYANA: This species is referred to as a "bush rope" by several collectors (i.e. Sandwith 599, Tillet & Tillet 45273, Jenman 4930), a term not used for other Clitoria species. It is not clear as to whether this name is a vernacular name, or a local expression used for a woody vine.

NOTES: This species includes those specimens that typically go by the name C. javitensis var. glabra Sagot. This group of plants has been excluded from the broad concept of C. javitensis as observed by Bentham in 1858 (cf. C. javitensis, pp. 379-384). Clitoria sagoti can be easily segregated from C. javitensis by the prominent uncinatate pubescence on the calyx, legume, and various plant axes, the raised midrib on the upper leaf surface, sessile inflorescences, short vexillum claw, and smaller fruits. Table 8 (p. 382) compares additional characteristics between the two species.

This species consists of three distinct varieties, nearly allopatric in distribution. The typical variety is conspicuously different from the other two varieties by the larger size of the leaflets, flowers, and calyx lobes. A second variety (var. caniculata) is easily recognized by the smaller bracteoles and petiolules, and the caniculate petioles. This is the only variety in which fruits have been collected. However, often in the Guianas, mixed collections have been made which contained a mixture of non-Clitoria fruits and Clitoria flowers. The third variety (var. sprucei) is widely separated geographically from the other two varieties, and superficially appears similar to C. cavalcantei which has a sympatric distribution. Clitoria cavalcantei can be distinguished from this variety by the impressed midrib on the upper surface of the leaflet, the lack of any uncinat pubescence on the calyx, and by the longer inflorescence, vexillum claw, and calyx tube.

Several of these specimens have been discussed in the literature as noted under the discussion of C. javitensis (cf. pp. 379-384). Additional specimens often bear annotations by Sandwith, who treated all of them as one species under the name of C. javitensis and by N. E. Brown, who treated most of them as separate species, although Brown never gave his species a name. Brown's concept of the groups is best summarized by the annotation note on the sheet of Gleason 556 (NY):

c.j. Bth. in J. L. Soc. 2: 42<sup>5</sup> was founded upon Spruce 1877/2320 and Schomburgk 1000/1723 which are certainly in my opinion all 3 perfectly distinct species and neither one of

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5. c.j.Bth. = Clitoria javitensis (H.B.K.) Benth., Journ. Linn. Soc. 2: 42. 1858. Bentham broaden the concept of the species when he transferred it from Neurocarpum to Clitoria.

them can be possibly the same as *N. jav. H.B.K.*,<sup>6</sup> on which the specific name is founded for that plant is stated to have pub. leaves, while those quoted by Benthams are all perfectly glab. beneath. Other parts of description are also at variance.

The present treatment nearly agrees with Brown that most of the cited collections by Benthams are distinct from *C. javitensis* and should be treated in a separate species. Spruce 2320 is a mixed collection of which one part belongs to *C. javitensis*. Spruce 1877 is placed in a new species, *C. cavalcantei*. The remaining specimens along with Sagot 120, cited by Sandwith (1931) in his discussion of this group, represent three distinct groups which are not distinguished enough from each other to be treated as separate species. Sagot 120 represents the typical variety of a new species, *C. sagotii*. The two Schomburgk collections represent var. caniculata. The second part of the mixed collection of Spruce 2320 represents var. sprucei.

Benthams (1858, p. 43) cited the two Schomburgk collections as "Rob. Schomburgk 1000" and "Rich. Schomburgk 1723." The Schomburgk 1000 collections (BM, CGE) bear the printed or written label data as "Roraima, Br. Guiana, 1842-3." The Kew specimen (Herb. Benthamsian, K-409) bears a printed label "Schomburgk, Br. Guiana, 1844" with the number 1000/1723. The incorrect date and lack of locality (i.e. Roraima) suggest that this specimen is not Schomburgk 1000. Is the collection then Schomburgk 1723? Or is it a mixed collection (there are two branches mounted on the sheet) of both Schomburgk collections? Or is there another explanation for both numbers on the Kew specimen?

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6. *N. jav. HBK.* = *Neurocarpum javitense* H.B.K., Nov. Gen. Sp. 6: 409. 1823.



DISTRIBUTION (Figure 53): This species has a wide distribution in the Guianas and the western Amazon Basin. It is typically found as a climber in forests or thickets, or occasionally as a trailing vine in more open areas, and notably associated with sandy soil. Elevations are rarely given by the collectors.

KEY TO VARIETIES:

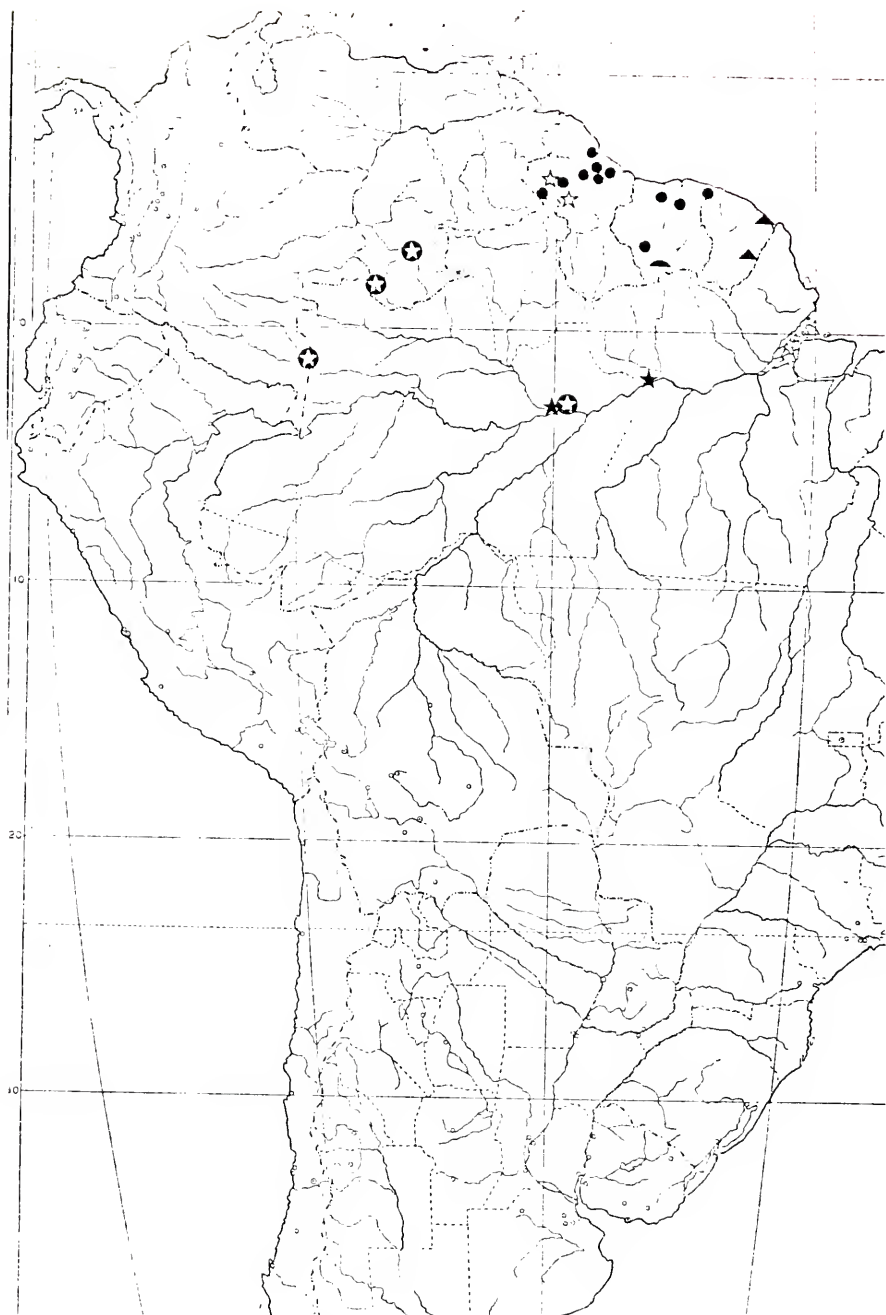
1. Calyx lobes 8-10 mm; ovary 13-15 mm; flowers large, 6-8 cm; leaves typically larger, leaflets 10-21 (25) cm long, 5-8 cm wide; petiole longer, 5-8.5 cm (French Guiana) . . . . . 23a. var. sagotii
1. Calyx lobe 5-8 mm; ovary 10-12 mm; flowers medium-large, 5-6.5 cm, rarely 7-8 cm in an individual flower; leaves typically smaller, leaflets (6.5) 6-15 (18) cm long, (2.5) 3-7 cm wide; petiole shorter, 1.5-5.5 (7) cm.
  2. Petiole more or less caniculate adaxially, bracteoles 4-6 (7) mm, inserted 2-3 mm below the calyx, petiolules typically 4-6 (7) mm; primary nerves of leaflet of 6-8 (9) pair (Guyana, Surinam) . . . . . 23b. var. caniculata
  2. Petiole more or less flattened adaxially, lacking grooves; bracteoles (6) 7-10 mm, inserted (1, 2) mm below calyx base; petiolules typically 6-9 mm; primary nerves of leaflet of 8-10 pairs (Western Amazon Basin: SE Colombia, S Venezuela, NW Brazil) . . . . . 23c. var. sprucei

23a. Clitoria sagotii Fantz var. sagotii

Clitoria javitensis (H.B.K.) Benth. var. glabra Sacc.

Ann. Sci. Nat. Ser. 6, 13: 299, 1832.

Figure 53. South American distribution of three species of section Cauliflorae. Clitoria sagotii var. caniculata (●), var. sagotii (▲), var. sprucei (☆); C. kaieateurensis (☆); C. leptostachya var. leptostachya (▲), var. fruticosa (★).



Clitoria javitensis (H.B.K.) Benth. var. guianensis Sagot,  
nom. in sched.

Primary nerves of leaflet 8-11 pair, leaflets (12) 15-21 (25) cm long, 5-8 (13) cm wide. Petiole 5-8.5 cm long, flattened adaxially, without grooves. Petiolules 6-9 mm. Flowers large, 6-8 cm. Calyx lobes elongate, 8-13 mm. Bracteoles 6-10 mm. Ovary elongate, 13-15 mm.

The typical variety is easily recognized by the elongated calyx lobes and more robust appearance.

PHENOLOGY: Flowers have been collected from December through February.

DISTRIBUTION: This variety was collected from mountain forests of French Guiana with only a single elevation recorded as 275 m.

FRENCH GUIANA. Rive gauche de la rivière Camopi upon summit montagne Alikéné, 17 Feb 1968, Olderman & Sastre 299 (NY,U); vic. camp montagne de Kaw, 275 m, 11 Dec 1955, Cowan 38706 (F,NY,RB).

23b. Clitoria sagotii Fantz var. caniculata Fantz, var. nov.

Primary nerves of leaflet of 6-8 pairs, leaflets (6.5) 8-16 (20) cm long, (2.5) 3-7 cm wide. Petiole 1.5-5.5 (7) cm, with a shallow to deep longitudinal groove adaxially. Petiole 1.5-5.5 (7) cm, with a shallow to deep longitudinal groove adaxially. Petiolules 4-6 (rarely 7-9) mm. Flowers 5-6.5 (rarely 4-8) cm. Calyx lobes 5-8 mm. Bracteoles 4-6 (7) mm. Ovary 10-12 mm.

This variety is easily recognized by its smaller bracteoles and caniculate petioles.

TYPE COLLECTION: GUYANA. Vine with woody stems either procumbent in the open or twining up low bushes in secondary wh.[ite] sand forest, sandhills, Demerara River, 22 Feb 1943, field no. F1197, Forest Dept. British Guiana 3933 (HOLOTYPE: K-413 sheet marked no. 2! Isotypes: K, sheet no. 1-not seen, NY!).

This collection is only one of three (including Cruz 1642 & Lanjou 1835) that possessed fruits, and the only one also possessing flowers, in addition to the characteristic caniculate petioles, shorter bracteoles, and smaller calyx lobes found on other collections. The Kew specimen is made the holotype because of dehiscent fruits exposing the seeds.

PHENOLOGY: Flowers have been collected nearly year round, from July through March. Fruits were collected from November through February and once in July.

DISTRIBUTION (Figure 53): This variety is found in dense upland woods and thickets or in open areas trailing along railroads, or it is commonly collected in Surinam savannas. It grows on sandy soils of Surinam and Guyana. Elevations usually are not reported by the collectors.

S U R I N A M. witzand savanne bij de nieuwe weg naar Hanover, 12 Feb 1961, Kramer, Hekking, & Tryon 2870 (U-2 sh.). MAROWIJNE: savannebos by Albina weg naar Moengo, 23 Jan 1956, Jonker-Verhoef & Jonker 359 (U-mixed). SURINAME: Brownsweeg, 29 Jun 1924, Bonteweren 6549 (U); Jodensavanne, Mapore kreek area, Suriname R., 6 Oct 1953, Lindeman 4888 (U). SARAMACCA: naar hot Wilhelmina gebergte, Boven Gran Rio, 17 Mar 26, Anonymous 271 (U-2 sh.); Tibiti savanna, 15 Jan 1949, Lanjouw & Lindeman 1835 (U-mixed); l.c., 11 Jan 1949, Lanjouw & Lindeman 1778 (NY,U).

G U Y A N A. Butukari, 20-21 Jul 1921, Gleason 714 (GH,NY);  
 BERBICE: between Demerra & Berbice R., 5°50'N, 15-19 Jul 1922, Cruz  
1642 (F,GH,MO,NY). DEMERARA: Demara R., Nov 1888, Jenman 4930 (K).  
 ESSEQUIBO: Adaro R. mouth, Kukui R., 500 m, 50 Sep 1960, Tillet &  
Tillet 45273 (NY-mixed,U); mile 20, Bartica-Potaro Road, 24 Dec 1948,  
Atkinson 23 (BM); Kabakaburi, Pomeroon Dist., 10-15 Feb 1923, Cruz 3332  
 (GH,NY,US); Rockstone, 15 Jul-1 Aug 1921, Gleason 556 (NY,US) and 543  
 (GH,NY); l.c., 31 Dec 1919-1 Jan 1920, Hitchcock 17309 (GH,NY,S,US);  
 Kamafusa, 9 Nov 1922, Lang & Persaud 67 (F); l.c., 15 Dec 1922, Lang &  
Persaud 358 (F); Essequibo R., Moraballi Creek near Bartica, 12 Nov 1929,  
Sandwith 599 (K,NY,RB); Roraima, 1842-3, Rob. Schomburgk 1000 (BM,CGE,  
 W); 1844, Schomburgk 1000/1723 (K).

V E N E Z U E L A. BOLÍVAR: Río Cuyuni, Feb 1949, Cardona 2796a  
 (VEN).

23c. Clitoria sagotii Fantz var. sprucei Fantz, var. nov.

Clitoria prostrata Spruce, nom. in sched.

Primary nerves of leaflet of 8-11 pairs, leaflets 7-18 cm long,  
 3-7 cm wide. Petiole 2-7 cm long, flattened adaxially, without grooves.  
 Petiolules 7-8 mm. Flowers 5-6.5 cm. Calyx lobes (5) 6-8 mm.  
 Bracteoles (6) 7-10 mm long, subtending and inserted 1 (2) mm below  
 calyx base. Ovary 10-12 mm.

TYPE COLLECTION: VENEZUELA [?]. Amazonas: AC. Tomo fl. Guaimie,  
 ubi in graminosis sylvanum humiliorum gregarie viget, 18 Aug 1854,  
Spruce 3543 (HOLOTYPE: K-433, Hb. Benth.). PARATYPES: Ad flum  
 Guainia v Rio Negro supra ostium fluv. Casiquiari, 1854, Spruce 3543

(G 195 & 196, GH, CGE-hb. Lindley, F 1546829, W 112030, RB 17245).  
 Prope San Carlos, ad Rio Negro Brasilia borealis, 1853-4, Spruce 3543  
 (BM, K-431, hb. Benth., W 18666. Isoparatypes: K-410, hb. Hooker,  
 mixed; NY-Cambridge Univ. Hb., mixed).

Spruce 3543 has the best flowering material and some dissected  
 flowers. This number includes three sets of data with all plants  
 collected within a small geographic area. The holotype specimen bears  
 Spruce's name C. prostrata, the probable original collection of the  
 three sets placed under one number by Spruce. The other two sets are  
 designated as paratypes, with two exceptions. A sheet at Kew (Hb.  
Hooker) and one sheet from New York (Hb. Cambridge Univ.) contain mixed  
 material, and thus are designated as duplicates of the paratype, or  
 isoparatypes, and are considered as non types in the determination of  
 the variety.

PHENOLOGY: Flowers have been collected in August, November, and  
 late April through early June.

DISTRIBUTION (Figure 53): This variety is widely distributed in the  
 western Amazon Basin in woods or open areas.

V E N E Z U E L A. AMAZONAS: São Gabriel-caatingas, May 1852,  
Spruce 2320 -B<sup>7</sup> (K-mixed); San Antonio, 121 m, Alto Orinoco, en selva  
 de Tierra firme, 27 Apr 1942, Williams 15043 (F, VEN).

B R A Z I L. AMAZONAS: Rio Cauabury between mouth or Rio Iá and  
 Rio Maturacá, 3-7 Nov 1930, Holt & Blake 439 (NY); basin Rio Negro,  
 Cajuri-Miki, 31 Jan 1942, Froés 12447/191 (A); 201 km Manaus-Itacoatiara  
 Rd., Rio Urubú, 10 Jun 1968, Prance et al. 5122 (NY).

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7. Compare with footnote 4 (p. 379) for an explanation of the  
 letter B.

C O L O M B I A. AMAZONAS: Río Caquetá, La Pedrera and vic.,  
2 May 1952, Schultes & Cabrera 16323 (NY).

24. Clitoria kaieteurensis Fantz, sp. nov.

Liana, trailing along ground or climber to 6-10 ft high. Branches 2-6 mm diameter, pith solid and sometimes dark-colored, juvenile branches subquadrangular, pubescence scattered uncinata and ca 0.5-1.3 mm long, appressed, rufous trichomes, branches becoming nearly terete, glabrate; bark dark-brown becoming dark grayish-brown, splitting in longitudinal strips; axillary buds 2-3 mm, scales ovate, acute, pubescence dense, appressed. Leaves 3-foliolate, coriaceous, leaflets oblong-elliptic, elliptic, ovate-elliptic or ovate to occasionally suborbicular, apex obtuse to broadly obtuse, abruptly acuminate, acumen 2-8 mm long, 2-10 mm wide at base, more or less mucronate, base rotund to weakly cordate, midrib impressed above, primary nerves of 8-10 pairs, upper surface dark green, glabrous, lower surface dull green, glaucous, pubescence spreading to suberect, moderately dense, becoming widely scattered with age, lamina 8-15 cm long, 4-9 cm wide. Petiole reddish-brown, subquadrangular to nearly terete, weakly longitudinally striated, occasionally with a shallow groove adaxially near the apex, 2-7.5 cm; pubescence scattered, uncinata and subappressed, rufous, becoming glabrate; rachis somewhat more compressed laterally, 1-3 cm. Petiolules quadrangular, dark-colored, rugose, 5-6 mm, pubescence appressed, rufous. Stipules deciduous, large and conspicuous, lanceolate to oblong-lanceolate, broadly acute, sometimes weakly arcuate, 8-19 mm long, 4-6 mm wide, pubescence sparse, appressed, ciliolate; stipels



linear-lanceolate to lanceolate, acute, pubescence lateral, stipels very conspicuous, weakly 5-nerved, 8-13 mm long, 2-3 mm wide, terminal stipels smaller, 4-9 mm long, 1-2 mm wide. Inflorescence axillary and cauliflorous, 1-4 peduncles per node, dark-colored, subsessile to 0.5 cm long, racemose, few-flowered (1-2, occasionally 3 pairs of flowers), axis pubescence of uncinat trichomes and a few spreading to erect trichomes. Pedicels 4-6 mm, pubescence predominately uncinat. Bracts variable; middle pair conspicuous, ovate-lanceolate, acute, 5-8 mm long, 2-3 mm wide, pubescence scattered, uncinat; outer bract hidden, ovate, broadly acute, 1.5-2 mm long, 1.5-2 mm wide. Bracteoles large, lanceolate, acute to subacuminat, 9-12 (15) mm long, 3-5 mm wide, inserted 1.5-2 mm below the calyx, pubescence uncinat, scattered. Flowers large, 6-7.5 cm, pale purple. Calyx pubescence moderately dense, predominately uncinat with a few, scattered, subappressed trichomes, tubes 14-18 mm long, 5-8 mm wide at base to 9-13 mm wide at throat, lobes ovate, acuminat, apex rapidly narrowed to a triangular acumen one-half the lobe length, 7-11 cm long, nearly one-half the tube length, 3-5 mm wide at base, ventral lobe 9-13 mm long, 1-1.5 mm wide. Vexillum pubescence moderately dense, uncinat, with occasional appressed trichomes, blade abruptly curved outward above claw, 3.4-4.5 cm wide, claw 6-9 mm. Alae extended well beyond carina by 8-11 mm, blade subfalcate, 17-21 mm long, 7-11 mm wide, claw 19-26 mm. Carina arcuate, 15-18 mm long, 4-5 mm wide, claw 27-33 mm. Stamens diadelphous, vexillary stamen coherent near base, tube glabrous, falcate, 39-43 mm long, free filaments 4-6 mm; anthers lanceolate, ca 1.7 mm long, 0.5 mm wide. Gynoecium falcate; gynophore 5-8 mm; ovary 13-17 mm long, 1.2-1.3 mm wide, pubescence white, tinged yellowish, style 23-27 mm,

geniculate 2-4 mm from distal end; stigma subcapitate, flattened. Legume stipitate, base enclosed within calyx lobes, flat, brown, pubescence of uncinata and scattered, rufus nearly erect trichomes, valves 8-13 cm long, 10-16 mm wide, beak when persistent, 5-7 mm; stipe 18-22 mm long, 2-3 mm thick expanding to 5 mm at apex; dehiscence causing valves to twist one-half to one turn. Seeds brown, smooth, subglobose, globose, face nearly orbicular, slightly compressed, 8-12 mm long, 7-11 mm wide, 4-5 mm thick, 7-9 seeds per pod; hilum 2 x 1 mm. Figure 54.

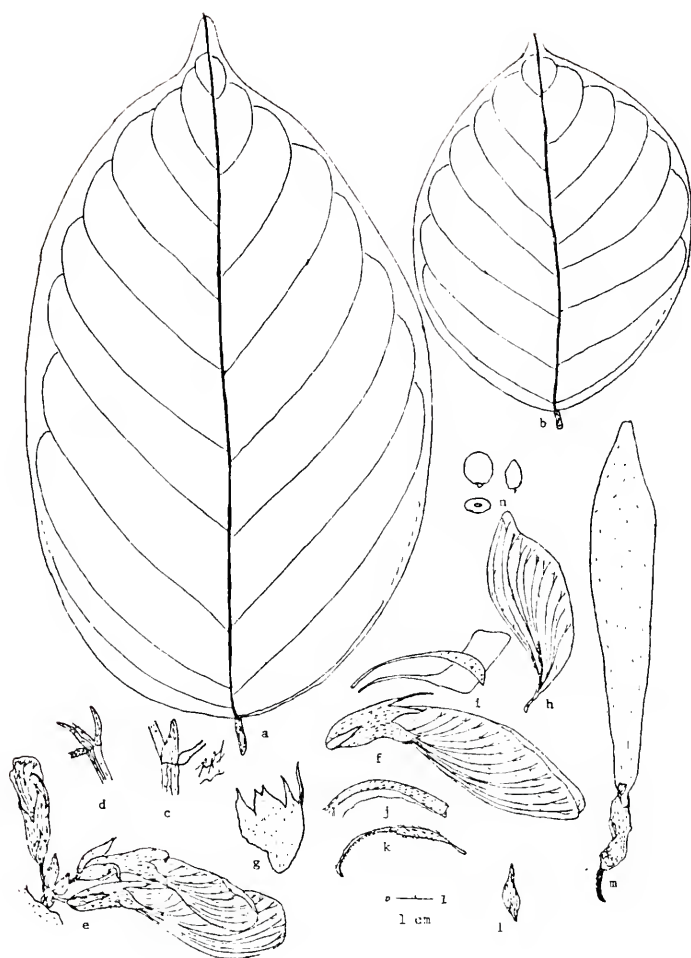
The Kaieteur Clitoria is characterized as a trailing to scrambling liana with large, conspicuous stipules, stipels, and bracteoles, glaucous leaves, and a sessile inflorescence bearing large purplish flowers with a calyx having elongate lobes. The long and broad bracteoles and stipules easily distinguish this species from all of its near relatives in section Cauliflorae. Two other species within this section (C. plumosa and C. obidensis) have conspicuously large stipules and bracteoles, but they are highly pubescent plants with large calyx tubes (2-3 cm) and lobes (1.3-2.7 cm).

PHENOLOGY: Flowers have been collected from September, October, February, and May. Fruits have been collected in February and May.

TYPE COLLECTION: GUYANA. Essequibo: locally frequent, scrambler, stem woody, leaves glaucescent beneath, fls. pale purple, cauliflorous, fr. greenish-brown, Kaieteur Savanna, 4 May 1944, Maguire & Fanshawe 23202 (HOLOTYPE: NY 3107. Isotypes: A, F 1280928, K-412, MO 1371651, U 72863A, US 1950981, VEN 28042).

The New York specimen is chosen as the holotype because it is the best representative specimen, which includes leaves, an inflorescence

Figure 54. Clitoria kaieteurensis. (a-b) leaflets, x 1; (c) stipule, x 1; (d) stipels, x 1; (e) inflorescence, x 1; (f) flower, x 1; (g) calyx, x 1; (h) vexillum, x 1; (i) ala and carina, x 1; (j) androecium, x 1; (k) gynoecium, x 1; (l) bracteole, x 1; (m) legume, x 1; (n) three views of seed, x 1. (Maguire & Fanshawe 23203, NY 3107: a,f-n; K-412: c-e; A: b.).



with flowers, a fruit still attached to its stipe, seeds (partially destroyed), and a dissected flower (found within the packet).

NOTES: The collections of this species have traditionally been identified as C. javitensis or as C. javitensis var. glabra. Clitoria kaieteurensis is easily distinguished from C. javitensis by the smaller fruits, uncinat pubescent calyx, white pubescent ovary, elongated style much longer than the ovary, and the sessile inflorescence. Clitoria kaieteurensis has its affinities with C. sagotii, which includes those plants previously known by the name of C. javitensis var. glabra. Clitoria sagotii is distinguished from C. kaieteurensis by the glabrous, non-glabrous leaves, smaller stipules and stipels, the raised midrib on the upper leaflet surface, smaller bracts and narrower bracteoles, a shorter androecium, and longer-stipitate, broader fruits with smaller seeds.

DISTRIBUTION (Figure 53): This species is an endemic that is locally abundant in the Kaieteur Savanna of Guyana, collected only once outside this region. Plants grow in sandy soil at elevations reported as near 500 m.

G U Y A N A. ESSEQUIBO: Kaieteur Savanna, Sep-Oct 1881, Jenman 1021 (K) and 1022 (K,NY); forest bordering brun-bracken savanna at Adaro R. mouth, Kukui River, ca 500 m, 5 Sep 1960, Tillet & Tillet 54273 (NY-mixed; non U); Membaru Creek, upper Mazaruni River, 15 Feb 1939, Pinkus 230 (NY,US).

25. Clitoria pendens Fantz, sp. nov.

Liana, to 30 m long (teste Irwin 54552). Branches typically 2-8 mm diameter, occasionally to 4 cm thick, pith hollow, branches

subquadrangular becoming terete, pubescence of branches uncinat with scattered, appressed trichomes (macrotrichomes deciduous well before the more persistent uncinat trichomes), then glabrous; bark grayish; axillary buds 2-3 mm, scales ovate, acute, pubescence uncinat with a few, suberect trichomes. Leaves 3-foliat, thick membranous to chartaceous, leaflets elliptic to ovate-elliptic, apex obtuse, nearly abruptly acuminate, acumen 1-2 cm long, 3-8 mm wide at base, mucronate, base broadly cuneate to rotund, midrib weakly raised above, primary nerves of 6-8 pair, concolorous (green) to slightly light green below, upper surface glabrous, lower surface glabrous (juvenile with pubescence erect, confined to nerves and midrib above), lamina 7-15 (27) cm long, 4-7 (10) cm wide, lateral pair of leaflets occasionally asymmetrical. Petioles subquadrangular to terete, 5-9 (11.5) cm, pubescence sparse to glabrous, trichomes uncinat; rachis (1.5) 2-4 (4.5) cm. Petiolules subquadrangular, rugose, 5-6 mm, pubescence sparse, of uncinat trichomes with occasional erect trichomes near leaflet base (juvenile leaflets). Stipules deciduous, lance-deltoid, acute, inconspicuously striate, 3-4 (5) mm long, 1 mm wide, pubescence uncinat with a few, appressed trichomes, to glabrous; stipels deciduous, linear, glabrous, 3-5 mm long, 0.2-0.8 mm wide. Inflorescence usually cauliflorous, multiflowered, racemose, unbranched or rarely branched near the base, highly elongated, generally 12-45 cm long bearing flowers to occasionally 95 cm long with fruit, nodose, primary lateral branches subsessile to 1 (2) mm, rarely to 5 mm long; inflorescences fascicled, inserted mainly near the base of the stem (teste Maguire 54265), pendent (teste Irwin 54552), or terminal and bearing small, deciduous leaves at the base; axis pubescence uncinat, dense, with some appressed,

rufus trichomes, becoming sparsely uncinata toward the base. Peduncles 2-10 cm, internodes 2-15 mm. Pedicels 3-5 mm. Bracts minute, inner bract caducous, solitary, linear, acute, 1-2 mm long, 0.2 mm wide, middle pair semipersistent, lanceolate, acute, 2-3 mm long, 1 mm wide, outer bract solitary, narrowly lanceolate, acute, 2-3 mm long, 0.5-0.7 mm wide. Bracteoles short, inconspicuous, narrowly lanceolate, acute, 3-5 mm long, 1-1.2 mm wide, inserted 1 mm below the calyx base, pubescence of sparse, appressed, rufus trichomes. Flowers large, 6-8 cm, juvenile white as opening, becoming pinkish to pale violet with age (teste Irwin 54552). Calyx pubescence predominately uncinata, with sparse to few, appressed, rufus trichomes, tube green with reddish-purple tinge, 17-24 mm long, 5-8 mm wide at base expanding to 9-15 mm wide at the throat, lobes ovate-deltoid, acute, 6-8 (9) mm long, 4-6 mm wide at base, ventral lobe 7-9 mm long, 2 mm wide. Vexillum pubescence uncinata to glabrate, blade abruptly curved outward near the base above the claw, 3.5-5 cm wide, claw 10-15 mm. Alae extended 4-6 mm beyond carina, blade suboblong-spatulate, 23-27 mm long, 7-10 mm wide, claw with uncinata pubescence, 23-26 mm long. Carina arcuate, 15-20 mm long, 5-7 mm wide, claw with uncinata pubescence, 34-36 mm long. Stamens diadelphous, vexillary stamen coherent near middle and coherent to free near the base, tube glabrous, weakly arcuate, 40-48 mm long, free filaments 2-6 mm; anthers lanceolate, 2-3 mm long, 0.7-0.8 mm wide, connective apiculate. Gynoecium weakly arcuate; gynophore 5-8 mm; ovary 18-20 mm long, 1.5-1.7 mm wide, pubescence dense, trichomes white, tinged yellowish; style 27-33 mm, geniculate 8-13 mm from the distal end; stigma capitate, 0.5-0.7 mm diameter; black to brownish, puberulent at base. Legume short-stipitate, base enclosed by calyx lobes to

slightly exerted, flat, pubescence uncinata with scattered subappressed to spreading trichomes, valves 13.5-16 cm long, 10-15 mm wide; stipe 23-31 mm long, 2-3 mm wide expanding to 5 mm at apex; beak 4-8 mm; dehiscence not observed. Seeds not observed, ca 7-8 per pod.

Figure 55.

The Pendent Clitoria is characterized as a liana with highly elongated, pendent, nodose inflorescences which bear large pinkish-purple flowers from a broad calyx.

PHENOLOGY: Flowers have been collected during two periods, from March to April and from July through August. Fruits were collected during July and August.

TYPE COLLECTION: SURINAM. Nickerie: Liana, cauliflorous, flowers mainly at base, calyx green and reddish, corolla lavender, wood yellow, in mesophytic forest, 9 km north Lucie River, 12 km west of Oost River, 3°36' to 3°41'N-56°30' to 56°34'W, 275 m, 16 Jul 1963, Maguire et al. 54265 (HOLOTYPE: NY).

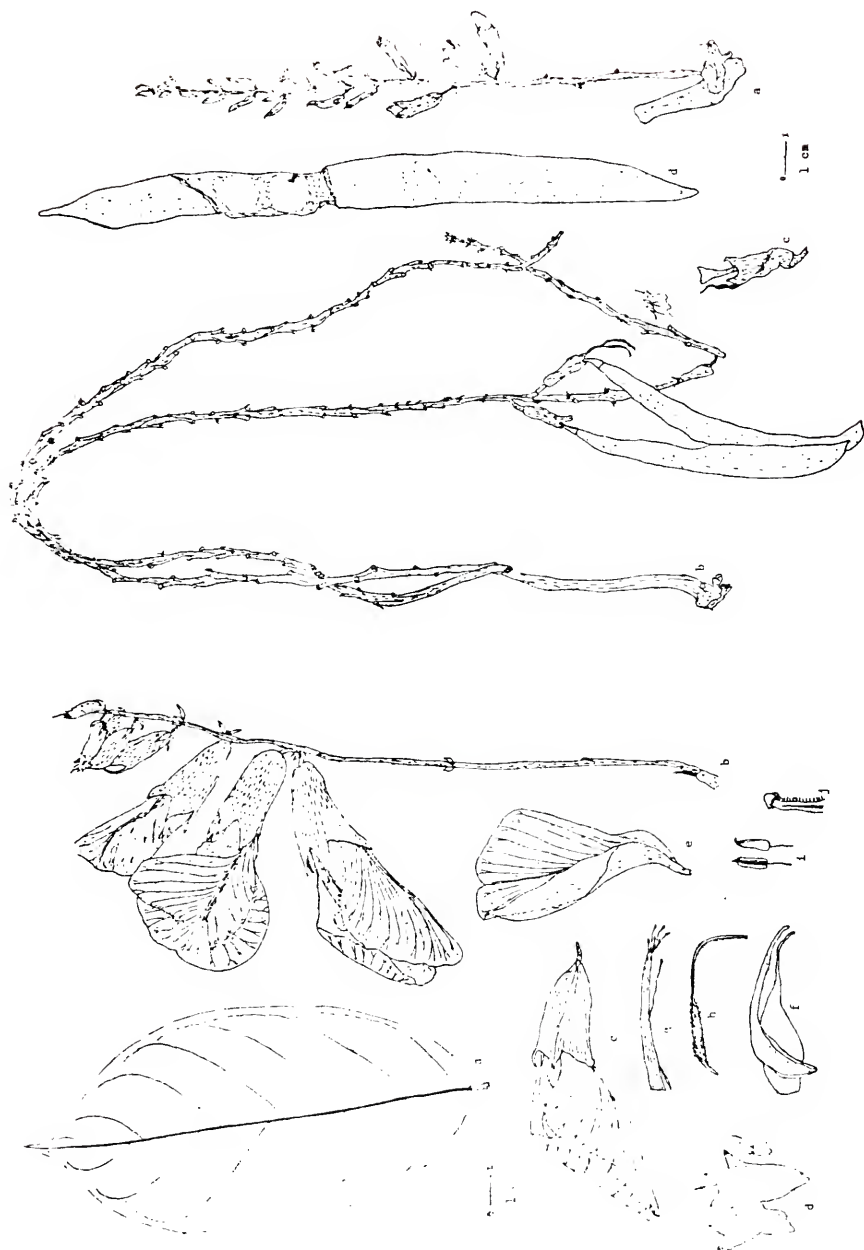
The specimen selected as the holotype is the only collection observed which has both flowers and fruits. However, this specimen does lack the vegetative structures. A second collection from the same locality, Irwin et al. 54552, was selected as a paratype. It has vegetative and flowering structures, some of which are in a dissected state. Both type collections have the characteristic elongated inflorescence.

VERNACULAR NAMES: SURINAM. Maného (Chuk.), Gonggrijp 3816. (SARAMACCA): Gatè-tété, (Mat.) Florschütz & Florschütz 1344.

NOTES: This species has close affinities with C. sagotii and C. kaieteurensis, but easily distinguished from them by the highly



Figure 55. Clitoria pendens. Left side: (a) leaflet, x 1; (b) inflorescence, x 1; (c) flower, x 1; (d) calyx, x 1; (e) vexillum, x 1; (f) ala and carina, x 1; (g) androecium, x 1; (h) gynoecium, x 1; (i) two views of anther, x 4; (j) style apex and stigma, x 5. (Cruz 1610, MO 897321: a-b. GH: e,g,i. Irwin et al., F 1615263: c-d,f,h,j.) Right side: (a) juvenile inflorescence, x 1/2; (b) old inflorescence, x 1/2; (c) calyx and stipe, x 1; (d) legume, drawn from broken pieces, x 1. (Maquire et al., NY: a,d. Pulle 310, U 37663A: b-c.)



elongated inflorescences and small bracteoles. This species also shows affinities with C. leptostachya. Historically, any specimen with very elongated inflorescences and lacking the large bracteoles that hide the calyx was identified as C. leptostachya, the most frequent name found on specimens of this species. Clitoria pendens is similar to C. leptostachya in pubescence, appearance of the inflorescence, and fruits. But C. pendens is distinguished from C. leptostachya by a large number of characteristics, as summarized in Table 10. Clitoria pendens is easily distinguished from C. leptostachya by the larger flowers, broader calyx with longer lobes, and the stouter inflorescence axis.

DISTRIBUTION (Figure 57): This species is found in mesophytic forest of Surinam and eastern Guyana at elevations (reported elevation data scanty) of 275-360 m.

S U R I N A M. 19 Apr 1922, Gonggrijp 3816 (U); fluv. Gonini, Aug 1903, Versteeg 148 (U). SARAMACCA: line from Paka Paka (Saramacca R.) to Ebbatop, near 20 km, 12 Feb 1951, Florschütz & Florschütz 1344 (NY,U); fluv. Saramacca, Mar 1903, Pulle 468 (U); Voltsberg, 23 Aug 1920, Pulle 302 (U-2 sh.) and 310 (U). NICKERIE: hills 9 km N of Lucie River, 12 km W of Oost River, 275 m, Irwin et al. (PARATYPES: F 1615263,GH,MO 1800897,NY,S,U 169942B,US 2447103); Lucie R., Iangslin Lucie-Julianatop, ca 360 m, 8 Aug 1963, Schultz 10348 (U).

26. Clitoria leptostachya Benth., Journ. Linn. Soc. 2: 43. 1858.  
Ternatea leptostachya (Benth.) Kuntze, Riv. Gen. Pl. 1: 210.  
 1891.

Liana or erect shrub with apex more or less scandent, glabrous.  
 Branches 3-10 mm thick with larger ones 2-3 cm in diameter, triquetrous,

Table 10. A comparison of some structures between C. leptostachya Benth. and C. pendens Fantz.

CHARACTER	C. LEPTOSTACHYA	C. PENDENS
LEAVES:		
Shape	Elliptic-lanceolate	Elliptic, Ovate-elliptic
Length/width ratio	2-3.5 : 1	1.8-2. : 1
Apex	Acumen 2-2.5 cm	Acumen 1-2 cm
Primary nerves*	8-11 pair	6-8 pair
Petiolules	3-5 mm	5-6 mm
Midrib above	Strongly raised	Weakly raised
INFLORESCENCE:	Slender	Stout
FLOWER SIZE: *	Medium, 4.5-6 cm	Large, 6-8 cm
CALYX:		
Tube length	16-21 mm	17-24 mm
Tube width throat*	Narrow, 7-10 mm	Broad, 9-15 mm
Lobe length*	4-6 (rarely 7) mm	6-8 (9) mm
BRACTEOLAS:		
Length	2 mm (Guianas) 3-4 mm (Brazil)	3-5 mm (Guianas)
Insertion	2-4 mm below calyx	Subtending, 1 mm below
PEDICEL: *	5-7 mm	3-5 mm
VEXILLUM:		
Claw	9-12 mm	10-15 mm
Pubescence	Glabrate	Uncinate
Curvature	Weakly outcurved	Strongly outcurved
ALAE:		
Beyond carina	3-4 mm	4-6 mm
Blade length*	13-18 mm	23-27 mm
Blade width*	4-6 mm	7-10 mm
Claw*	19-22 mm	23-26 mm
CARINA:		
Blade length*	11-15 mm	15-20 mm
Blade width*	3-5 mm	5-7 mm
Claw*	26-32 mm	34-36 mm
ANDROECIUM:		
Column*	32-37 mm	40-48 mm
Anther length*	1.5-2 mm	2-3 mm

Table 10. --Continued

CHARACTER	C. LEPTOSTACHYA	C. PENDENS
GYNOECIUM:		
Ovary length*	12-15 mm	18-20 mm
Ovary width*	1.2-1.3 mm	1.5-1.7 mm
Style vs. ovary*	Slightly longer	Much longer
Style length*	17-19 mm	27-33 mm
Geniculate length*	Last 6-9 mm	Last 8-13 mm
LEGUME:		
Width	12-20 mm	10-15 mm

\*major differences

longitudinally furrowed between angles, pith solid, juvenile branches subquadrangular and becoming nearly terete to angled, pubescence of minute, white, appressed trichomes, soon glabrous; bark brown. Leaves 3-foliate, chartaceous, concolorous to slightly lighter green below, glabrous or when juvenile with occasional inconspicuous pubescence along the nerves below, juvenile leaflet elliptic becoming elliptic-lanceolate to elliptic-oblong, apex acuminate, acumen 2-2.5 cm long, 2-4 mm wide, occasionally arcuate distally, more or less mucronate, base broadly cuneate to weakly rotund, midrib subraised to strongly raised above, primary nerves of 8-11 pairs, lamina 7-15 (21) cm long, 4-7 (9) cm wide. Petioles subquadrangular-terete, occasionally longitudinally striated, 5-9 (13) cm, glabrate, pubescence appressed, more or less scattered; rachis weakly compressed laterally, 2.5-3.5 (4) cm. Petiolules darkened, rugose, 3-5 mm. Stipules deciduous, linear, acute, 2-5 mm long, 1 mm wide, pubescence uncinata with few appressed trichomes; stipels deciduous, linear to subulate, 1-4 mm long, 0.1-0.5 mm wide. Inflorescence axillary and solitary, or cauliflorous and fascicled (2-4 peduncles), slender, multiflowered, juvenile axis pubescence of short, appressed trichomes, dense becoming scattered, and exposing uncinata trichomes, peduncles 2-11 cm, internodes 1-6 cm. Pedicels dark-colored, 5-7 mm, pubescence of uncinata and moderately dense, appressed trichomes. Bracts variable, middle pair elliptic to oblong, broadly acute, 3-4 mm long, 1.5-2 mm wide, outer bract ovate, obtuse, 1.7-2 mm long, 1.5 mm wide, inner bract caducous, subulate. Bracteoles short, inconspicuous, lanceolate to ovate, acute, 1.5-4 mm long, 1-1.2 mm wide, pubescence of uncinata and some appressed trichomes. Flowers medium-sized, 4.5-6 cm, pale violet

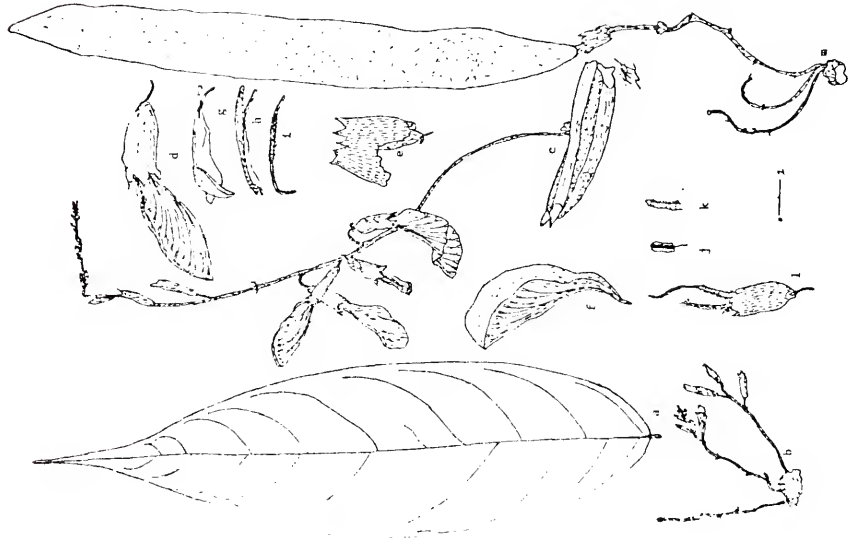
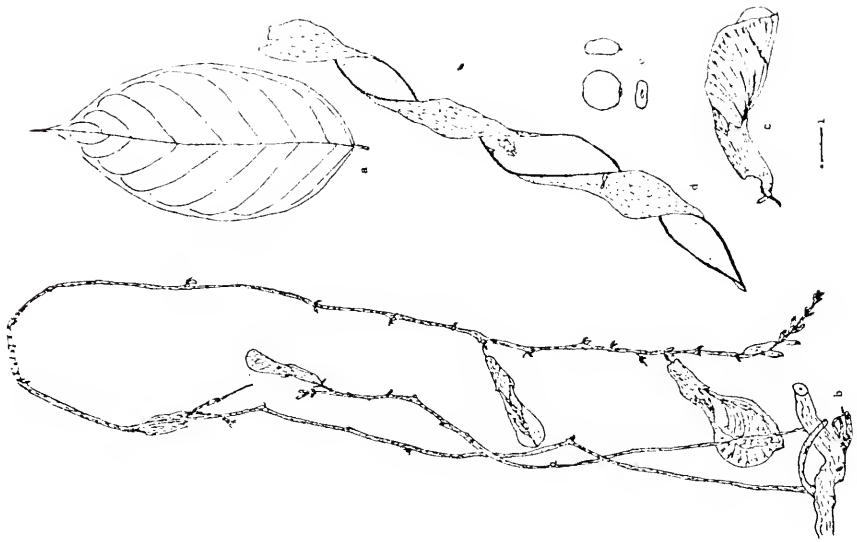
to rose to pink to white. Calyx pubescence of uncinata and scattered, subappressed trichomes, tube 16-21 mm long, 5-7 mm wide at base expanding to 7-10 mm wide at the throat, lobes ovate-deltoid, acuminate for ca one-third of their length, 4-6 mm long, 2-4 mm wide, ventral lobe 5-7 mm. Vexillum pubescence glabrate to uncinata, blade curved outward at base just above claw, 4-5 cm wide, claw 9-12 mm. Alae extended beyond carina 3-4 mm, blade with uncinata pubescence, 13-18 mm long, 4-6 mm wide, claw 19-22 mm. Carina weakly falcate, 11-15 mm long, 3-5 mm wide, claw 26-32 mm. Stamens diadelphous, vexillary stamen coherent near base, tube weakly arcuate, split at base, 32-37 mm, free filaments 2-4 mm; anthers lanceolate, 1.5-2 mm long, 0.5-0.7 mm wide, connective acute. Gynoecium weakly arcuate; gynophore 7-9 mm; ovary 12-15 mm long, 1-1.3 mm wide; pubescence dense, trichomes white, tinged yellowish; style slightly longer than the ovary, 17-19 mm long, geniculate 6-9 mm from the distal end; stigma dark-colored, capitate, ca 0.5 mm in diameter. Legume long-stipitate, exerted slightly above calyx, flat, pubescence of uncinata and scattered, spreading trichomes, valves 13-18 cm long, 12-20 mm wide; stipe 23-31 mm long, 2-3 mm wide expanding to 5 mm at apex; beak not observed; dehiscence causing valves to twist 2.5-3 turns. Seeds rarely observed, black, weakly compressed, face suborbicular, 10-11 mm long, 11-12 mm wide, 3-4 mm thick, hilum oblong, 2.5 mm x 1 mm. Figure 56.

Slender-spiked Clitoria is characterized as a more or less scandent shrub with highly elongated, slender inflorescences which bear medium-sized flowers from a narrow calyx.

PHENOLOGY: This species flowers from May through September with fruits produced in August and September.

Figure 56. Clitoria leptostachya. Left side: var. leptostachya: (a) leaflet, x 1; (b) juvenile inflorescence, x 1; (c) inflorescence, x 1/2; (d) flower, x 1; (e) calyx and bracteole, x 1; (f) vexillum, x 1; (g) ala and carina, x 1; (h) androecium, x 1; (i) gynoecium, x 1; (j) anther, x 5; (k) stigma and style apex, x 4; (l) calyx and juvenile fruit, x 1; (m) inflorescence with matured fruit, x 1. (Schomburgk s.n., K-28, hb. Benth.: a,c. Forest Dept. Br. Guiana 7210, NY: b,d-m.) Right side: var. fruticosa: (a) leaflet, x 1; (b) matured inflorescence, x 1/2; (c) flower with bracteoles, x 1; (d) legume, x 1; (e) three views of seed, x 1. (Ducke 17244, S: d-e. US 1442540: b-c. Ducke 235, A: a.)





TYPE COLLECTION: GUYANA. Last collection alpha, Rob. Schomburgk s.n. (LECTOTYPE: K-28, hb. Benth.; S=photo of K).

Bentham cited two syntype collections as "In Guiana anglica ad flumen Corentyn superius prope fines Brasiliensium, Rob. Schomburgk, coll. ii. sine num., et in Surinamo, Hostmann." Bentham noted that the Hostmann collection had racemes, "tripollicare" flowers, but lacked any leaves. Clitoria leptostachya is absent from Surinam and has medium-sized flowers. No Hostmann collection bearing a distinct, elongated inflorescence, has been examined, but based upon the description by Bentham and examination of other Surinam specimens, the Hostmann syntype probably would be excluded from this species and be assigned to C. pendens, which has large flowers and a wide distribution in Surinam.

The only Schomburgk specimen observed with elongated inflorescences lacks the full data cited by Bentham, but the specimen in Bentham's Herbarium at Kew placed in a type folder matches the original description of the leaves, stem, inflorescence, and flowers. The stem in particular was described by Bentham as "caules saepe elevato-triquetri faciebus sulcatis, raro teretes." The three-angled stem with a sulcate channel between the faces was observed in only two Clitoria collections from all those examined for the genus. These collections included Rodrigues 457 (US) and the Schomburgk specimen at Kew. Since the Schomburgk specimen is the most probable collection examined by Bentham, and the only collection which matches the description published by Bentham, it was selected as the lectotype.

NOTES: This species shows close affinities with C. pendens, a new species previously included within C. leptostachya. Clitoria leptostachya is easily distinguished from C. pendens by the smaller flowers, more

slender inflorescence with longer internodes, and narrower calyx.

Table 10 summarizes other characteristics that segregate the two species.

DISTRIBUTION (Figure 53): This species is found in forests on sandy soil of Guyana and eastern Amazonas to western Pará, Brazil.

Elevations have not been reported by collectors.

KEY TO VARIETIES:

1. Bracteoles ovate, 2 mm; ovary 14-15 mm; anthers 1.5 mm x 0.5 mm; legume broader, 15-20 mm wide; flowers pinkish-white to white-mauve; leaflet with midrib weakly raised above; liana (GUYANA) . . . . . 26a. var. leptostachya
1. Bracteoles lanceolate, 3-4 mm; ovary 11-13 mm; anthers 1.7-2 mm x 0.5-0.7 mm; legume narrower, 12-16 mm wide; flowers rose to lilac; leaflet with midrib strongly raised above; shrub, apex more or less scandent (BRAZIL). . . . . 26b. var. fruticosa

26a. Clitoria leptostachya Benth. var. leptostachya

Liana. Leaflet with midrib weakly raised above. Bracteoles minute, ovate, 2 mm. Flowers whitish, pinkish-white to white-mauve. Ovary 14-15 mm long. Anthers 1.5 mm long, 0.5 mm wide. Legume 15-20 mm wide.

DISTRIBUTION (Figure 53):

G U Y A N A. Mission Field, 24 Sep 52, Forest Dept. Br. Guiana 7210 (NY); along Berbice-Rupununi cattle trail, 10 Jun 1919, Abraham 171A (NY).

26b. Clitoria leptostachya Benth. var. fruticosa Fantz, var. nov.

Shrub with apex occasionally climbing. Leaf with midrib raised above. Bracteoles short, 3-4 mm long, lanceolate. Flowers pigmented, rose- to lilac-colored. Ovary 11-13 mm long. Anthers 1.7-2 mm long, 0.5-0.7 mm wide. Legume 12-16 mm wide.

TYPE COLLECTION: BRAZIL. Pará: prope medium fl. Tapajoz, loco Quataguara, 15 Aug 1923, Ducke 17244 (HOLOTYPE: S. Isotypes: G 209 & 210, hb. Barbey-Boissier, RB 17244, 2 sh., U 63828; US 1442540).

The Stockholm specimen has the only fruits and seed along with the inflorescences, flowers, and vegetative structures. It has the characteristic structures and is a better specimen.

DISTRIBUTION (Figure 53):

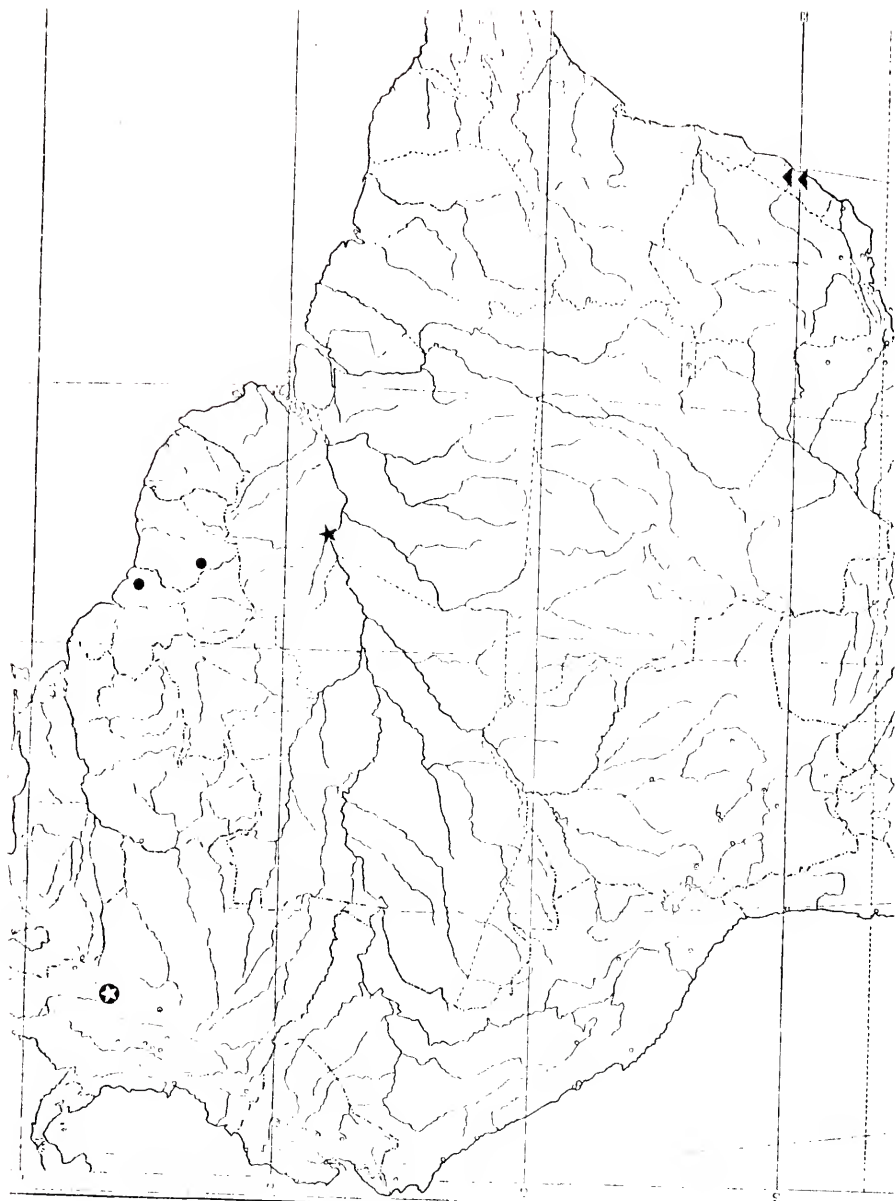
B R A Z I L. PARÁ: Faro, 12 May 1911, Ducke 11652 (RB-2 sh.). AMAZONAS: Manaus, 17 Sep 1929, Ducke 23405 (RB); Reserva Florestal Ducke, do Buiao, Manaus, 6 Aug 57, Rodrigues 457 (US); margen do Igarapé, do Buiao, Manaus, 23 Jul 56, Coelho 3930 (US); estrada da Forquilha, Manaus, 4 May 56, Coelho 3807 (US); Manaus & estrada do Alexio, 16 Jul 1936, Ducke 235 (A,F,MO,NY,S).

27. Clitoria selloi Benth., Journ. Linn. Soc. 2: 42. 1858.

Ternatea selloi (Benth.) Kuntze, Riv. Gen. Pl. 1: 210. 1891.

Liana. Branches 3-8 mm thick, subterete, pith hollow, juvenile branches with pubescence of uncinata and conspicuous, dense, pilose trichomes, branches soon becoming glabrate then glabrous; bark reddish-brown, peeling in longitudinal strips, light brown beneath. Leaves

Figure 57. South American distribution of four species of section  
Cauliflorae. Clitoria obidensis (★); C. pendens (●);  
C. plumosa (☆); C. selloi (▲).



3-foliate, thick membranaceous, concolorous, leaflets oblong-elliptic to oblong-lanceolate to oblong, apex obtuse, abruptly acuminate, acumem usually 0.5-1 (2) cm long, 2-7 mm wide, mucronate, base broadly cuneate, midrib weakly raised above, primary nerves of 8-11 pair, upper surface glabrous, lower surface pubescent, trichomes subappressed to appressed, dense, becoming moderately scattered, lamina generally 7-16 cm long, (2.5) 3-4.5 cm wide. Petioles subterete, more or less weakly compressed laterally, 3-7 cm, pubescence pilose becoming glabrate, trichomes rufus; rachis weakly compressed laterally, 1-1.5 cm. Petiolules quadrangular, 3-5 mm, pubescence pilose, moderate to scattered, trichomes rufus. Stipules ovate to short-lanceolate, acute, weakly striated, 3-5 mm long, 2 mm wide, glabrate with sparse, uncinat trichomes and scattered, subappressed trichomes; stipels lanceolate, acute, weakly striated, glabrate, 3-5 mm long, 0.5-1.5 mm wide. Inflorescence axillary or cauliflorous, usually solitary, racemose, multiflowered, flowers crowded toward the apex; axis 3-11 (16) cm long, quadrangular, twisting, nodose, pubescence of uncinat and rufus, spreading to erect trichomes, becoming glabrous. Pedicels 4-6 mm becoming to 8 mm in fruit. Bracts lanceolate, acute, pubescence sparse to moderate, pilose, ciliate; inner bract linear, caducous, 3-4 mm long, 0.5 mm wide; middle pair persistent, reflexed in age, 3-5 mm long, 1-2 mm wide; outer bract deciduous, nearly equal to the middle pair. Bracteoles lanceolate, acute, 6-8 mm long, 1.5-2 mm wide, inserted ca 2 mm below calyx base, pubescence sparse to moderately dense, pilose, ciliate. Flowers small, 3-4 cm, pale violet, darker-colored medially on vexillum inner surface. Calyx pubescence conspicuously rufus, pilose, moderately dense, becoming scattered with

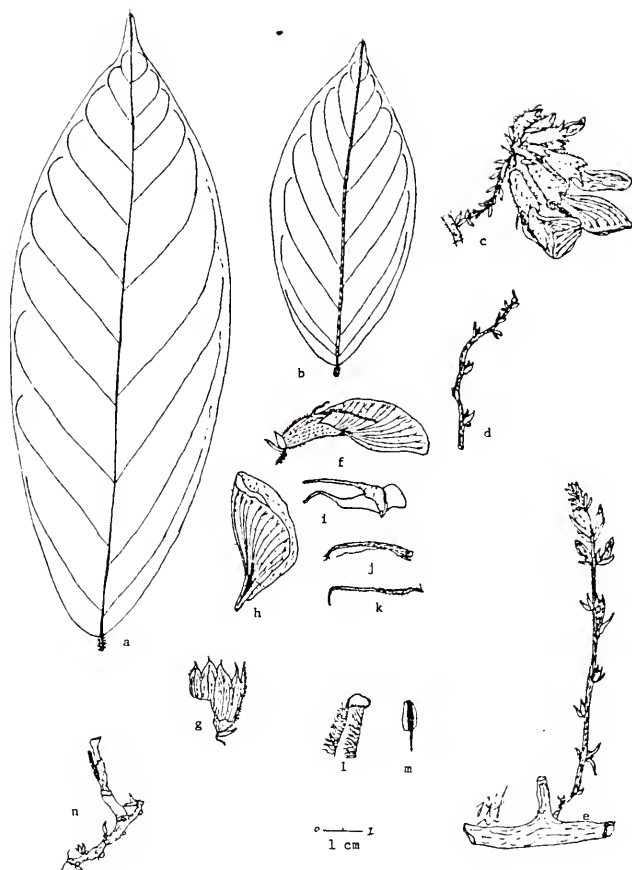
age and more conspicuously uncinatc, tube 10-13 (15) mm long, 3-5 mm at base expanding to 6-7 mm at throat, lobes ovate, 4-6 mm long, 2-3 mm wide at base, apex rapidly narrowed to acuminate tip to 2 mm, ventral lobe 5-7 mm long, 1 mm wide. Vexillum pubescence uncinatc, blade weakly to strongly outcurved above claw, 1.5-2 cm wide, claw 5-8 mm. Alae extended beyond carina 3-6 mm, blade subfalcate-spatulate, 13-18 mm long, 3-7 mm wide, claw 9-15 mm. Carina falcate, 8-11 mm long, 3-5 mm wide, claw (15) 18-22 mm. Stamens glabrous, weakly arcuate, vexillary stamen coherent below middle, tube more or less split near base, 24-28 mm, free filaments 1-3 mm; anthers 1.5-2 mm long, 0.5 mm wide, connective acute. Gynoecium weakly arcuate; gynophore dark-colored, 4-7 mm; ovary pubescence white to occasionally slightly tinged yellowish; 10-12 mm long, 1 mm wide, style 13-17 mm long, geniculate 5-7 mm from the distal end, beard dense, trichomes nearly 1 mm long; stigma capitate, ca 0.5 mm in diameter. Legume unknown; stipe 13 mm long, 2-3 mm wide expanding to 5 mm at apex. Figure 58.

Sellow's Clitoria is characterized as a liana with medium-sized inflorescences bearing small violet flowers from a pilose calyx. The major axes of the plant are densely and conspicuously rufus, pilose, as is the calyx in the juvenile stages. This species is the only one in the section Cauliflorae with small flowers, and it is also the only species of the section found in the eastern coastal states of Brazil.

PHENOLOGY: Dates of collection usually were not recorded, except in two instances (April and September), both with flowers. From the general appearance of the plant's leaves, inflorescences, and flowers, the blooming period, if continuous, is more likely to be September to



Figure 58. Clitoria selloi. (a-b) leaflets, x 1; (c) juvenile inflorescence, x 1; (d-e) older inflorescences, x 1; (f) flower, x 1; (g) calyx, x 1; (h) vexillum, x 1; (i) ala and carina, x 1; (j) androecium, x 1; (k) gynoecium, x 1; (l) style apex and stigma, x 10; (m) anther, x 5; (n) old inflorescence with stipe, x 1. (Sello 993, K-25, hb. Benth.: b-c,k-l,n; BM: f-j,m. Riedel 243, BM: a,d. Blanchet 3093A, G-hb. de Candolle: e.)



April rather than from April to September. The specimen collected in April had larger leaves and older inflorescences.

TYPE COLLECTION: BRAZIL. 1815-17, F. Sello [or Sellow] 993  
(LECTOTYPE: K-25, hb. Benth; S=photo of K. Isotypes: BM-2 sh.).

Benth (1858) cited the type collected as "Sello, in Brasilia (media? or australiore?)." No collection number was designated. There are two Sellow collections known. Sello 1008-811 (B-not seen, destroyed in war; F-fragment and photograph of Berlin specimen!) lacks the voluble condition of the stem described by Benth. Sellow 993 in the Benth Herbarium at Kew is highly voluble and agrees with the original description. Benth (1862) cited Sellow for C. selloi. The Berlin and British Museum specimens lack the "w" in Sellow's name whereas the specimen in Benth's Herbarium (K-25) has "Sellow" and is the probable type specimen, thus designated as the lectotype for the species.

NOTES: A specimen of C. selloi has been collected only once in the last century, and rarely in the twentieth century. Specimens apparently fall into two distinct groups. The two Sellow collections are highly rufus-pubescent, with short inflorescences crowded with flowers, and the buds are conspicuously pilose. The Blanchet and Riedel collections have elongated inflorescences, more widely spaced internodes, aborted flowers, and sparse to scattered pubescence. It is believed that these two groups represent collections made in early bloom and near the end of the blooming season. The plant appears to be highly pubescent in early stages of growth, the pubescence becoming less dense with age. This is a common characteristic observed in a number of species of Clitoria. Inflorescences are crowded with flowers in early blooming

stages of growth, losing aborted flowers with an elongation of the axis, as is typical of other species with medium-sized inflorescences.

Bentham noted the affinities of C. selloi to be near C. arborescens, but he did not elaborate. However, the species shows closer affinities to C. leptostachya which is similar in the flowering and vegetative structures. Clitoria selloi can be easily distinguished from the other liana species by its small flowers and disjunct geographical location.

DISTRIBUTION (Figure 57): This species is widely removed geographically from the other species of section Cauliflorae. It is found along the eastern coastal states of Brazil, from Bahia to Rio de Janeiro.

B R A Z I L. Campo Vitoria, Sello 1008-811 (F-frag. from and photo of B). BAHIA: partie meridionale, 1840, Blanchet 3039A (G-3 sh.); arenos maritime pr. Ilhéus, Sep 1821, Riedel 243 (BM,NY,W). ESPÍRITO SANTO: via Lagoa do Brazil, Rio Doce, 15 Apr 1934, Kuhlmann 219 (RB). RIO DE JANEIRO: entre Lagoa do Peixe et Rio Bonito, env. Rio de Janeiro, 1882, Glaziov 12548 (G,NY).

28. Clitoria obidensis Huber, Bol. Mus. Goeldi Para 5: 405. 1909.

Liana, voluble and tall climbing, shrubby base. Branches 2-6 mm in diameter, nearly terete, pith solid, pubescence of uncinat trichomes hidden by conspicuous, erect, rufus, stiff trichomes of 1-1.5 mm long, very dense on juvenile branches becoming moderately spaced. Leaves 3-foliate, thick chartaceous, concolorous, leaflets elliptic to elliptic-oblong or elliptic-lanceolate, occasionally obovate, apex acuminate to cuspidate, acumen 1-2 (3) cm long, 2-4 mm wide, mucronate,

base broadly cuneate to weakly rotund, midrib and primary nerves prominently raised above, densely pubescent, primary nerves of 6-8 (9) pairs, widely spaced, upper surface conspicuously pubescent, trichomes rufus, 0.5-1.5 mm long, subappressed to falcate, slightly stiff, texture more or less rough to the touch, lower surface with similar pubescent, more dense, lamina 8-17 cm long, 2-7 (9.5) cm wide.

Petioles subquadrangular to terete, 3-7 cm, pubescence of uncinata trichomes hidden by hispid, rufus trichomes of 1-2 mm; rachis 1.5-2.5 (4) cm. Petiolules subquadrangular, 3-6 mm; pubescence moderately dense, hispid, rufus, and inconspicuously uncinata. Stipules large, ovate-lanceolate, acute to acuminate, 6-11 (15) mm long, 2-3.5 mm wide, pubescence uncinata, ciliate, with a few hirsute, rufus trichomes at apex and base; stipels large, linear-lanceolate, 6-10 (15) mm long, 0.7-2 mm wide, pubescence as stipules, terminal stipel one-half to two-thirds the length of the lateral stipels. Inflorescence terminal and axillary at denuded nodes, racemose, few flowered (4-8 flowers) short, 0.5-1 (1.3) cm, solitary, axis with pubescence uncinata hidden by conspicuous, hirsute, rufus trichomes. Peduncles 2-6 mm; rachis internodes 2-5 mm. Pedicels 3-5 mm. Bracts large, conspicuous, dark-colored, lanceolate to oblong, more or less short-acuminate, middle pair 8-11 mm long, 2.5-3.5 mm wide, outer pair 6-8 mm long, 2-3.5 mm wide. Bracteoles large, conspicuous, length subequalling to longer than calyx tube, oblanceolate to oblong-lanceolate, apex acuminate, base abruptly attenuate, 20-35 mm long, 4-6 mm wide, inserted 1-2 mm below calyx base, pubescence of uncinata and rufus, hirsute trichomes at apex and scattered elsewhere. Flowers large, rose-colored, usually with complicate vexillum 5-6.5 cm long and spreading vexillum at 7-8.5 cm.

Calyx chartaceous, nerves more or less conspicuous, pubescence of uncinata and rufus, spreading trichomes primarily confined toward base and dorsal and ventral margins, tube 20-27 mm long, 5-7 mm wide at base expanding to 9-14 mm wide at the throat, lobes highly elongated, lanceolate, long acuminate, apex often bent, ciliate, 20-27 mm long, 5-8 mm wide, ventral lobe 20-25 (occasionally to 35) cm long, 2-4 mm wide; lateral lobes overlapping dorsal lobes at base, dorsal lobe innermost. Vexillum pubescence of uncinata and a few scattered trichomes, blade 4-5 cm wide, claw 6-8 mm. Alae extended beyond carina 4-7 mm, blade subfalcate-spatulate, 26-34 mm long, 6-10 mm wide, with sparsely uncinata pubescence, claw 18-20 mm. Carina falcate, blade 10-15 mm long, 4-7 mm wide, with sparsely uncinata pubescence, claw 31-33 mm. Stamens diadelphous, vexillary stamen nearly free, tube weakly arcuate, glabrous, abruptly incurved last 4-8 m, 40-50 mm, free filaments 2-5 mm; anthers lanceolate, 2-3 mm long, 0.7-0.9 mm wide, connective acute. Gynoecium nearly straight to weakly arcuate; gynophore 3-5 mm; ovary 13-17 mm long, 1-1.5 mm wide, pubescence tawny-sericeous; style 27-35 mm, geniculate 9-12 mm from the distal end, beard dense, trichomes to 2 mm long; stigma capitate, flattened, ca 1 mm in diameter, with ring of minute white hairs at base. Legume short-stipitate, (stipe to 1.5 cm fide Rizzini, p. 186, 1963; base of legume thus well enclosed within calyx), valves flat, more or less weakly raised around seeds, pubescence uncinata with scattered, subappressed, stiff, rufo-tawny trichomes, denser along sutures, surface obliquely striolate, valves 7-10 cm long, 10-15 mm wide; beak to 4 mm; stipe not observed; dehiscence causing valves to twist one to one and one-half turns. Seeds subglobose, weakly compressed on two sides, face

suborbicular, subconvex, black, 7-8 mm long, 8 mm wide, 4-5 mm thick, 8-12 seeds per pod; hilum oblong, 2 mm x 1 mm. Figure 59.

The Obidos Clitoria is characterized as a conspicuously rufous-pubescent liana with short inflorescences bearing large rose-colored flowers from a long calyx tube with elongated lobes, and having long, conspicuous stipules, stipels, bracts, and bracteoles.

PHENOLOGY: Collections of this species are scarce, but those collected have produced flowers from mid May to late June and fruits in May.

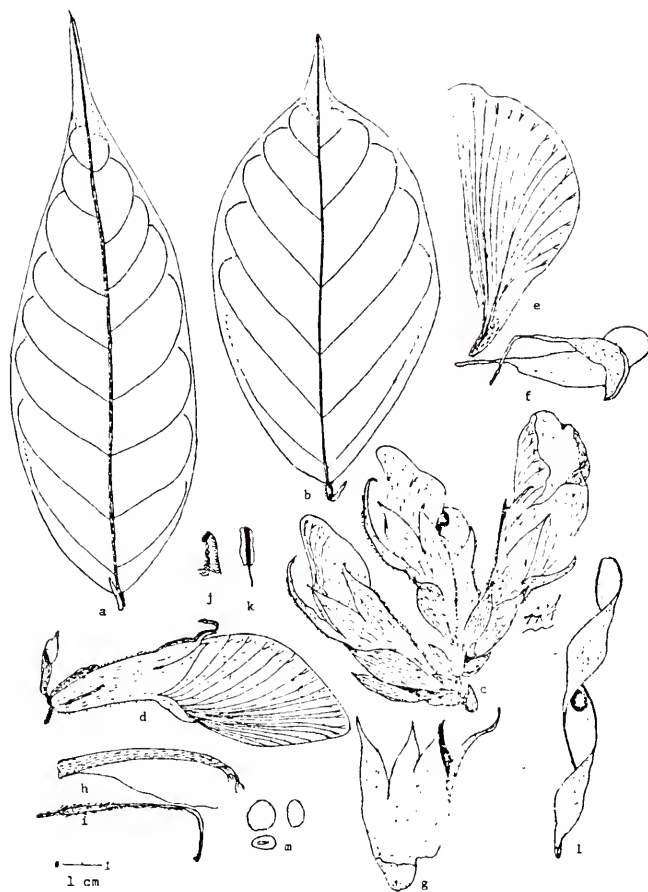
TYPE COLLECTION: BRAZIL. Pará: in silvis prope Obidos, 10 May 1905, Ducke 7215 (LECTOTYPE: MG 7215; F=photo of MG! Isotypes: BM! RB 11846-2 sh.! Cotype: F 602328).

Huber did not select a holotype specimen. The specimen at the Goeldi Museum is the probable specimen examined by Huber, as this specimen has been photographed and distributed as the type, and Huber published the description of the species in the bulletin of that institution. This specimen has not been examined, although the duplicates (BM,RB) and a dissected flower and a leaflet from the type and its photograph (F) have been examined. The specimen deposited at the Goeldi Museum has the best material and more nearly matches the description of Huber; thus, it is designated as the lectotype.

NOTES: Huber noted that this species had probable close affinities with C. stipularis. Clitoria obidensis is superficially similar to both C. stipularis and C. densiflora in appearance in that all three species are conspicuously pubescent, have large flowers, and prominent stipules and bracteoles. However, C. stipularis and C. densiflora differ greatly from C. obidensis by the viscid seeds, costate legume with convex

Figure 59. Clitoria obidensis. (a-b) leaflets, x 1; (c) inflorescence, x 1; (d) flower, x 1; (e) vexillum, x 1; (f) ala and carina, x 1; (g) calyx, x 1; (h) androecium, x 1; (i) gynoecium, x 1; (j) stigma and style apex, x 4; (k) anther, x 4; (l) legume, x 1; (m) three views of seed, x 1. (Ducke 7215, F 602328: e-k; RB 11846: d,l-m. Ducke 11861, BM: a; S: b; FLAS 122959: c.)





valves, small ovary, and 10-nerved calyx, all characteristics of the subgenus Neurocarpum. Clitoria obidensis is far removed from C. stipularis and C. densiflora.

Clitoria obidensis has affinities with C. plumosa which is distinguished by its very elongated stipules, medium-sized inflorescence, shorter calyx lobes, and the elongated, plumose, ventral calyx lobe.

DISTRIBUTION (Figure 57): This species is endemic to the forest near Obidos, Brazil. Huber (1909) illustrated Ducke's collection sites on a map and placed the forest from which Ducke had collected specimens NNE of Obidos.

B R A Z I L. PARÁ: Obidos, 25 Jun 1912, Ducke 11861 (BM,FLAS, G,S,U,US).

29. Clitoria plumosa Fantz, sp. nov.

Liana, high growing to forest crown (teste Haught 2075) conspicuously pubescent, trichomes dense, rufus, spreading to erect, more or less stiff, 1.5-3 mm long. Branches 5-8 mm thick, reddish-brown, angular becoming terete, dense rufo-pubescent, pith hollow ca one-half of the diameter. Leaves 3-foliate, conspicuously pubescent on both surfaces with long, rufus trichomes, thick membranaceous, leaflets oblong to elliptic-oblong, rarely slightly wider above the middle, apex obtuse, abruptly acuminate, acumen 0.5-1 cm long, to 4 cm wide, mucronate or with bristle tip of 3-6 mm, base broadly cuneate, margins rufus-ciliate midrib weakly raised above, primary nerves of 10-12 pair, upper surface dark green, moderately pubescent, lower surface green, densely pubescent especially on nerves, lamina 9.5-16 cm long, 4-6 cm

wide. Petioles angular-terete with swollen base of 6-7 mm, 11-14 cm long, densely pubescent at the base to moderately dense above, trichomes spreading to erect, tawny-rufus; rachis 4-5 cm. Petiolules dark-colored, quadrangular, 4-5 mm; pubescence of uncinat trichomes hidden by dense, long rufus trichomes. Stipules highly elongated, conspicuous, persistent, narrowly oblong-lanceolate, narrowing gradually the last two-thirds of its length into a long acumen, 19-29 mm long, 2-4 mm wide; pubescence ciliate with outer surface glabrate; stipels highly elongated, narrow stipule-like, terminal stipels 8-15 mm long, 0.3-1 mm wide, lateral stipels 12-20 mm long, 1-1.5 mm wide.

Inflorescence cauliflorous, multiflowered, crowded, axis 10-15 cm long, conspicuously bracteated, pubescence of scattered, uncinat trichomes hidden by conspicuous, dense, long, rufus trichomes. Pedicels 5-8 mm, densely pubescent. Bracts persistent, very conspicuous, stipule-like, 13-16 mm long, 2-4 mm wide, pubescence of uncinat trichomes with a few, scattered, long trichomes, and ciliate, lowermost bracts short, 7-11 mm. Bracteoles highly-elongated, stipule-like, long acuminate, more or less attenuate base, 22-25 mm long, 3-4 mm wide, inserted 1 mm below calyx and often slightly spreading, pubescence ciliate with uncinat trichomes and scattered, long trichomes. Flowers very large, 7.5-9 cm, light yellow flushed red (teste Haught; yellow is a rare color in the genus, but other species with this color are white, fading to yellow with age). Calyx pubescence dense, spreading, tawny-rufus, tube 27-30 mm long, 8-10 mm wide at base expanding to 10-14 mm wide at throat, lobes deltoid-lanceolate, rapidly narrowing to long-acuminate tip, dorsal lobes 15-18 mm, lateral lobes 13-16 mm long, 4-5 mm wide, ventral lobe highly elongated with linear base and sublate

apex, plumose, 23-28 mm long, 0.3-1 mm wide. Vexillum pubescence glabrate to scattered-uncinate, densest toward base and margins, blade 4.5-5 cm wide, claw 9-11 mm. Alae extended beyond carina 6-8 mm, blade falcate-spatulate, 30-35 mm long, 5-10 mm wide, claw 23-26 mm. Carina falcate, blade 13-17 mm long, 6-8 mm wide, claw 34-38 mm. Stamens diadelphous, vexillary stamen free to base, tube nearly straight, incurved slightly at base and apex, 49-53 mm long, free filaments 3-6 mm; anthers lanceolate, 2.7-3 mm long, 1 mm wide, connective apiculate. Gynophore subsessile; ovary 21-22 mm long, 1-1.3 mm wide, pubescence white, soft, spreading-ascending (to 3 mm wide including pubescence); style 31-33 mm long, geniculate 13-14 mm from the distal end, beard dense, trichomes long; stigma capitate, flattened, ca 1 mm in diameter. Legume unknown. Figure 60.

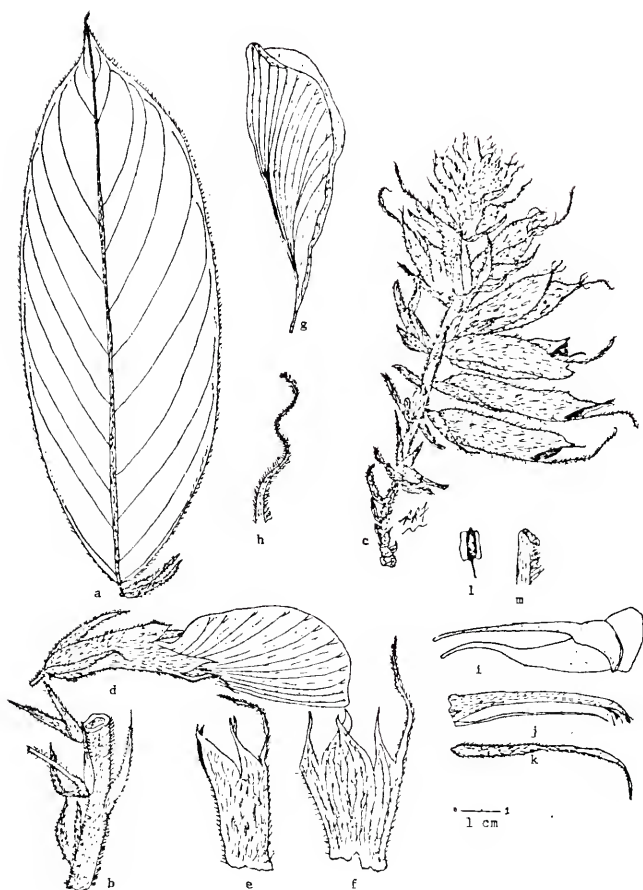
The Plumose Clitoria is characterized by the conspicuously reddish-pubescent appearance, medium-sized, conspicuously bracteate, inflorescences bearing crowded, very large flowers with a calyx having an elongated, plumose ventral lobe, and the narrow, elongated bracteoles, bracts, stipules, and stipels.

PHENOLOGY: The one collection of the species had flowers mostly in early stages of maturity in mid-November.

TYPE COLLECTION: COLOMBIA. Santander: Viscaina Creek, 32 km S of El Centro, vicinity of Barranca Bermeja, Magdalena Valley, between Sogamoso and Carare River, ca 100 m, 15 Nov 1936, Haught 2075 (HOLOTYPE: UC M 049493. Isotypes: F 1450138, GH,NY).

Both the specimens from Gray Herbarium and Field Museum are more fragmentary, having an inflorescence, a couple of leaflets, and a flower placed in the packet. The other two collections have much more material

Figure 60. *Clitoria plumosa*. (a) leaflet with stipels, x 1; (b) stem with stipules, x 1; (c) inflorescence, x 1; (d) flower, x 1; (e-f) two views of calyx, x 1; (g) vexillum, x 1; (h) ventral calyx lobe, x 2; (i) ala and carina, x 1; (j) androecium, x 1; (k) gynoecium, x 1; (l) anther, x 3; (m) stigma and style, x 5. (Haught 2075, UC 49493: a-b,d-m; NY: c.)



and a dissected flower. The specimen deposited at the University of California has more mature leaves and stem, and therefore, is selected as the holotype.

NOTES: This species is easily recognized by the elongate, plumose ventral calyx lobe and the elongated stipules, stipels, bracts, and bracteoles. Clitoria plumosa has close affinities with C. obidensis which is distinguished by its short inflorescences, elongated calyx lobes subequal to the tube length, and shorter bracteoles, bracts, and stipules.

DISTRIBUTION (Figure 57): This species is known only from the type locality in Santander, Colombia.

Subgenus ClitoriaII. Clitoria L. subgenus Clitoria.Ternatea Tourn., Mem. Math. Phys. Acad. Roy. Sci. p. 103.1706; nom. inval.Clitorius Petiv. ex Dill., Hort. Elth. p. 90. 1732; nom. inval.Clitoria L., Gen. Pl. 1: 216, no. 572. 1737; nom. inval.Ternatea Tourn. ex Mill., Gard. Dict. ed. 4, 3: TERNATEA. 1754.Vexillaria Eaton, Man. Bot. p. 82. 1817; nom. superfl.Ternatea Tourn. ex Kunth, Nov. Gen. Sp. 6: 415. 1824.Clitoria L. sect. Ternatea (Tourn. ex Kunth) DC., Prod. 2: 233. 1825.Nauchea Desc., Mem. Soc. Linn. Par. 4: 7. 1826; nom. superfl.Clytoria Presl, Rostl. 3: 196. 1835; nom. illeg. (?orthogr. pro. Clitoria L. 1753)<sup>1</sup>Clitoria L. subgenus Ternatea (DC) Baker, Fl. Br. India p. 208. 1879.

Suffrutescent herbs, erect or twining, or occasionally a liana.

Leaves commonly 5- or 7-foliate, infrequently 9- or 11-foliate, rarely 3- or 1-foliate; leaflets small, 2-9(12) cm long, 0.1-5 cm wide, midrib weakly to strongly raised above, upper surface pubescent, either microscopically uncinata or macroscopically strigose, trichomes ca 1 mm, scattered, upper surface occasionally becoming glabrate with age, lower surface usually strigose. Petioles shorter than rachis,



typically 0.5-4 cm long. Petiolules short, 0.7-4 mm. Stipules narrow, 0.1-2 mm wide, 1-5 nerved; stipels very narrow, 0.1-0.4 mm wide. Inflorescence axillary, usually solitary, commonly bearing 1 or 2 flowers at apex of peduncle, occasionally racemose, few-flowered; axis typically short, 0.2-1 (1.5) dm. Bracts typically 1-7 mm long, 0.2-4 mm wide. Bracteoles ovate to nearly orbicular, often one-half to occasionally subequalling the calyx size and hiding it, membranaceous, subpellucid, 3-, 5-nerved, inserted at the base of the calyx. Flowers chasmogamous, small to medium-sized, 2.5-6 (6.5) cm, papilionaceous or very rarely actinomorphic (5 vexillum-like petals and some to all stamens free). Calyx subpellucid, (5-) 10-nerved, somewhat shrinking in fruit but persistent; tube short, 0.4-1.4 cm long, pubescence of uncinata and scattered, short, subappressed to spreading trichomes; lobes typically subequal to tube length, occasionally shorter, typically (2) 4-11 mm long. Vexillum short-clawed, 1-5 mm, occasionally longer to 8 mm, commonly glabrate. Alae claw 7-14 mm, blade variable. Carina 5-10 mm long, 2-6 mm wide, claw short, 10-18 mm long. Stamens diadelphous, vexillary stamen more or less connate near base; staminal tube short, (0.8) 1-2 cm; anthers small, 0.7-1.5 mm long, 0.5-1 mm wide. Gynophore short, 1-1.5 mm; ovary small, 0.5-0.8 cm long; style short, 0.7-1.8 cm, beard dense below stigma. Legume subsessile, base connate, enclosed within persistent calyx, valves flat, ecostate, thickened on sutures, nearly straight to weakly curved at apex, ventral margin sometimes undulating; stipe 1.5-2 mm. Seeds smooth, compressed, subreniform, small (2-6 mm long x 3-8 mm wide), usually 1-10 seeds per pod. Seed germination epigeal. (x=8).

The members of the subgenus Clitoria can be characterized as typically suffrutescent herbs with 5- to 11-foliate leaves, subpellucid, 5- or 10-nerved calices which have lobes nearly equal to the tube length, subpellucid, ovate to orbicular bracteoles, 1- or 2-flowered pedunculate inflorescences, and with flat, ecostate fruits bearing compressed, reniform seeds lacking a viscid coat.

HOLOTYPE SPECIES: C. ternatea L.

Nomenclaturally, this subgeneric group has historically been known by the name Ternatea. A. P. de Candolle (1825) segregated this group from other Clitoria species primarily by the number of leaflets (i.e. 5 or 7 leaflets).<sup>8</sup> He gave this group sectional status where it has been known historically as Clitoria L. section Ternatea DC. A. P. de Candolle (1825) cited Kunth as the author of Ternatea. Kunth (1824) cited Tournefort as the author of Ternatea. Tournefort (1706) published the generic name Ternatea, but being pre-Linnaean (i.e. published before 1 May 1753), his name is invalidly published in accordance with the rules established by the International Code of Botanical Nomenclature (Stafleu, 1972). Kunth has been recognized historically as the first to validly publish the name Ternatea, thus the full citation would be Ternatea Tourn. ex Kunth. When de Candolle transferred the genus Ternatea to be sectional level, it became Clitoria L. sect. Ternatea (Tourn. ex Kunth) DC. when fully cited. Recently, the Gray Herbarium Card Index noted that Miller had validly

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8. The other characters used (i.e. tubular calyx and spurless vexillum) are common to all Clitoria species, but were used to segregate section Centrosema. Today, Centrosema is recognized as a segregate genus from Clitoria.

published Tournefort's name in 1754. Neither Kunth nor de Candolle referred to Miller's publication.

Baker (1879) elevated de Candolle's section to the subgeneric level as Clitoria L. subg. Ternatea (DC) Bak. He used the fruit (i.e. pods flat, ecostate) as the segregating structure. Baker's treatment has not been followed by other botanists. Most commonly de Candolle was followed and this group treated (in floras) as section Ternatea. Baker's treatment of this group at the subgeneric level has probably been overlooked in the literature, as opposed to not being accepted by his botanical colleagues, because his publication is never cited by later authors.

The name Euclitoria was introduced by de Candolle (1825) as a sectional name and applied to a different group of Clitoria species. These species, historically known as the "true clitorias," belong to the subgenus Neurocarpum. The name Euclitoria has been misapplied historically because the "true clitorias" should be that group including C. ternatea, the generic type which has never been included under the name Euclitoria. In accordance with present nomenclatural rules under the International Code of Botanical Nomenclature (Stafleu, 1972), the epithet of a subdivision of a genus containing the type species is either of the same form as the generic name, or a plural adjective agreeing in gender (Art. 21). In addition, the epithet is not to be formed by the prefix "Eu-." The name Euclitoria is illegitimate even if had been applied to the correct group. Baker's subgeneric name Ternatea must be rejected since this subgenus contains the type species of the genus, and in accordance with the Code, the epithet must be of the same form as the generic name. Therefore, the

correct name for this subgenus would be Clitoria L. subg. Clitoria. In a vernacular sense, the species of this subgenus should be considered as the "true clitorias."

NOTES: Members of the subgenus Clitoria have several characteristics shared by the primitive subgenus Bractearia, including flat, ecostate fruits which bear smooth, compressed seeds, epigeal seed germination, and the lack of cleistogamy. Members of subgenus Clitoria also have a number of characteristics shared by the advanced subgenus Neurocarpum. With the exception of C. lasciva, the habit is suffrutescent. Reduction in size has occurred in a number of structures, including fruit length and width, stipe length, seed dimensions, leaf size, petioles, leaf blade dimensions, the gynoecium, and the androecium. Seeds have become reniform in shape. Calyx nerves have become more distinct, with each of five nerves, leading to the apex of one lobe, and five additional nerves more or less distinct, with each nerve leading to a sinus and dichotomously forking such that each branch becomes marginal in adjacent lobes. Inflorescences bear few flowers, typically one or two at the apex of an axillary peduncle. Subgenus Clitoria appears to represent an evolutionary line that departed early from that of Neurocarpum.

Members of subgenus Clitoria exhibit several characteristics that are distinct from the other two subgenera. Leaves are typically 5- to 11-foliate. Bracteoles and calyx are subpellucid, membranaceous, translucent to somewhat clear, and bearing raised, prominent nerves. In the dried state, the nerves appear to hold the structure intact since the tissue between nerves easily tears when manipulated with a probe. It also appears that this tissue quickly shrinks somewhat in

size and shrivels slightly when specimens are collected and pressed, as evidenced by the specimens examined. The same condition is characteristic of the bracteoles and calices of fruiting material. Shrinking in size and shriveling of the calyx and bracteoles do not occur typically in the other two subgenera, neither of which have subpellucid calices nor bracteoles, but have persistent calices which retain nearly the same size during fruit stages as in the flowering stage. Fruits are subsessile with the stipe typically 1-1.5 mm. Although very limited research has been done on the karyogamy of species of Clitoria, from the available evidence, it appears that  $x=8$  may be typical for the subgenus.

Bracteoles in this subgenus infrequently exhibit a primitive condition observed in sections Bractearia and Flexuosa of subgenus Bractearia. Some bracteoles become quite large, nearly orbicular in shape, hiding the calyx, 11-15 mm in diameter (bracteoles are commonly 5-10 mm), and are very conspicuous when compared to others within the species. Examination of additional nodes of the same plant or additional material of the same collection deposited at different institutions usually reveals that both the typically more advanced and the primitive bracteole types exist, and there is often a gradient of sizes and shapes. The primitive bracteole type is observed most commonly in African specimens of C. ternatea.

The African species C. kaessneri would appear to be misplaced if only the vegetative form is considered, having 3- or 1-foliate leaves typical of a number of Neurocarpum species. Subgenus Neurocarpum is commonly absent from Africa except for two introduced species (C. falcata and C. laurifolia) which have become naturalized in

isolated populations. Examination of C. kaessneri indicates that the species has non-viscid seeds, flat, ecostate fruits borne on a sessile stipe, and subpellucid calices, characteristics associated with subgenus Clitoria, not with Neurocarpum, the species of which have viscid seeds, convex, turgid, costate fruits, and subcartilaginous calices. Asian members of subgenus Neurocarpum have ecostate fruits, but have long calyx lobes, which C. kaessneri does not possess. Clitoria kaessneri agrees with the size gradient of a number of flower structures when compared to other species within subgenus Clitoria. Its affinities lie with those species of subgenus Clitoria, not with those of subgenus Neurocarpum. Thus, it is the only species within this subgenus with less than five leaflets.

Clitoria lasciva is unique as the only woody member (a liana) of the subgenus, and in exhibiting an elongated, racemose inflorescence bearing several flowers. Clitoria ternatea is unique in producing a variety with "double" flowers that have actinomorphic petals and free or nearly free stamens.

Within the subgenus there is a trend toward reduction in size of a number of structures, including the flowers and their associated structures, the leaves (particularly in leaflet size), and the fruits. These trends can be observed within the largest species, C. ternatea, a polymorphic species. Clitoria heterophylla exhibits the maximum reduction reached by this evolutionary line. Many of its structures are the smallest known for the genus.

DISTRIBUTION (Figure 11): Members of subgenus Clitoria are pantropical. The large range of the subgenus is due predominantly to one species, C. ternatea, which has been transported to foreign

lands by man at least since the late Seventeenth Century. The native distribution of the subgenus was probably in the paleotropics, which included Africa (excluding western Africa?), Madagascar and the Mascarene Islands, and the Indian peninsula (and Ceylon?). Clitoria ternatea has been introduced as a cultivar, and often establishing itself natively as a weed in the neotropics, in numerous Pacific Islands, in Australia, and probably in Indonesia and Southeast Asia.

KEY TO THE SPECIES:

1. Leaves 5-, 7-, 9-, or 11-foliate; legume 4-11 mm broad; seeds compressed, 0.5-2 mm thick; stipules narrow, 0.3-1.5 mm wide; petiolules short, 0.7-3 mm long.
2. Legume 6.5-11 cm long, 8-11 cm wide (ca 2.5 cm x 5 mm in rare C. ternatea var. pilosula); staminal tube 13-20 mm, or three to all stamens are free; anthers 1-1.5 mm long; ovary 6-9 mm; style 12-18 mm; flowers (3) 3.5-6.5 cm, papilionaceous or rarely double with five vexillary-like petals, actinomorphic; alae extending beyond carina 6-10 mm, blade 16-28 mm long; carina 7-10 mm long.
3. Inflorescence 4-15 cm, 4-8 flowered; flowers 5.5-6.5 cm; calyx tube 6-8 mm; larger bracts 4-6 mm; ovary 6-7 mm; leaves 7-, 9-, and 11-foliate; liana (Madagascar) . . . . . 30. C. lasciva
3. Inflorescence 0.5-1.5 cm, 1 (2) flowered; flowers (3) 3.5-5.5 cm; calyx tube 8-14 mm; larger bracts 2-4 mm; ovary 7-9 mm; leaves 5- and 7-foliate; suffrutescent herb forming tangled mats or climbing (Pantropical) . . . . . 31. C. ternatea

2. Legume 2-5 (6) cm long, 4-8 mm wide; staminal tube 8-11 mm; anthers 0.7-1 mm long; ovary 5-6 mm; style 7-12 mm; flowers 2.5-3.5 cm, papilionaceous; alae extending beyond carina 2-4 mm, blade 8-11 mm; carina 5-7 mm long.
  4. Herbaceous vine; stipules 1-3 mm; stipels 1 mm; bracteoles 2-3 mm long, 0.4-1.0 mm wide; calyx lobes 2-3 mm; peduncles 1-(2) flowered; leaves dimorphic, type I oval to orbicular, type II linear (a branch may produce only 1 type), pubescence above uncinata (Madagascar & Mascarene Islands) . . . . . 32. C. heterophylla
  4. Erect herb; stipules 6-11 (16) mm; stipels 3-7 (9) mm; bracteoles 6-11 mm long, 3-5 mm wide; calyx lobes 4-8 mm; peduncles 2-flowered; leaves monomorphic, leaflets basically lanceolate, pubescence above scattered strigose (India) . . . . . 33. C. biflora
  1. Leaves 3- and 1-foliate; legume 10-15 mm wide; seeds 2-3 mm thick; stipules broad, 1.5-2 mm wide; petiolules 3-4 mm (Angola, Zaire, Zambia) . . . . . 34. C. kaessneri
30. Clitoria lasciva Bojer ex Benth., Ann. Wein. Mus. Natur. 2: 114. 1837.
- Clitoria lasciva Bojer, Hort. Mauritianus p. 92, 1837;  
nom. nud.
- Ternatea lasciva (Boj. ex Benth.) Kuntze, Riv. Gen. Pl. 1: 210. 1891.



Liana, climbing in shrubs and trees, conspicuously pubescent. Stems 1-1.5 m (teste Bojer 76), lignose, longitudinally striate, twining, 2-4 mm in diameter, pith hollow, ca 1-1.5 mm in diameter, pubescence short, densely pilose, becoming puberulent with age. Leaves 7-, 9-, and 11-foliate, thick-membranaceous, leaflets basically ovate, becoming elongated with age, oblong-ovate, lanceolate-ovate, or elliptic-ovate, to lanceolate, mottled with black spots on both surfaces (vidi 8 x), more conspicuous on upper surface, apex acute, variable from short- to long-tapered apex, base rotund to weakly retuse, midrib raised above and often bearing minute remnants of trichomes along midrib and major nerves, primary nerves of 6-8 pairs, to 11 pairs on elongated leaflets, upper surface dull, dark green, with pubescence moderately strigose on juvenile leaflets, becoming widely scattered to glabrate with age, lower surface pale green, with sericeous pubescence on juvenile leaflets, trichomes becoming scattered, subappressed, lanima 2-6 cm long, (1) 1.5-2.5 (rarely 3) cm wide. Petiole caniculate above (more rarely sulcate), shorter than the rachis, 0.5-4 cm; pubescence dense to medium, short-pilose; rachis 4-11 cm long, internode segments 0.5-2 cm long with terminal segment clearly the shortest; petiolules subterete, 2-3 mm long, pubescence spreading, moderate to dense. Stipules linear, conspicuously narrow, long-tapering to an acute apex, prominently 5-nerved at base becoming 3-nerved near midway and 1-nerved near apex, 5-8 mm long, 1-1.5 (2) mm wide; pubescence short-pilose; stipels linear, extremely narrow, 1-3 mm long, 0.1-0.2 mm wide. Inflorescence axillary, solitary, racemose, (2) 4-6 (8) flowered, predominantly 4-9 cm long occasionally to 15 cm long in robust specimens; axes

pubescence short, pilose-puberulent; peduncles subquadrangular, longitudinally striate, 3.5-6 (12) cm; rachis internodes 0.4-1.5 cm. Pedicels 4-7 mm. Bracts pubescent, trichomes short, spreading; inner bracts not observed; middle bract lanceolate, persistent, often hidden by outer bract, 3-4 mm long, 1.5-2 mm wide; outer bract large, showy, bracteole-like, ovate to broadly ovate, more or less apiculate, conspicuous palmately nerved, 4-6 mm long, 3-4 mm wide. Bracteoles broad ovate, translucent, membranaceous, short-acuminate, 5-8 mm long, 3-6 mm wide, inserted 1 mm below calyx, pubescence spreading-pilose, ciliolate. Flowers blue, in dry state pale blue to purplish-blue with yellowish middle on vexillum; perianth base and outer surface mottled black spotted. Calyx short-tubular in flower, becoming campanulate-tubular in fruit as upper lobes spread apart from lower lobes and tube shrinks slightly, 5- or 10-nerved, five nerves prominent, each entering a lobe and extending to the apex, five nerves somewhat prominent, each leading to a sinus, dichotomously forking with each branch extending from one-third to one-half of the way marginally into adjacent lobes, pubescence of uncinata and conspicuously appressed to spreading trichomes, tube 6-8 mm long, 3-4 mm wide at base expanding to 5-7 mm wide at throat, lobes oblong to ovate-oblong, apex obtuse, abruptly acuminate, ciliate, subequalling the tube length, 6-8 (9) mm long, 3 mm wide, vexillary lobe similar, 7-9 mm long, 3 mm wide. Vexillum glabrate, (5) 5.5-6.5 cm long, 4-4.5 cm wide, claw minute, 3-4 mm. Alae extended well beyond carina by 6-10 mm, blade 17-21 mm long, 6-10 mm wide, claw 8-12 mm. Carina subfalcate, 8-10 mm long, 3-5 mm wide, claw 12-15 mm. Staminal tube bearing pilose to ascending hairs towards base, vexillary stamen nearly free, tube 13-17 mm long,

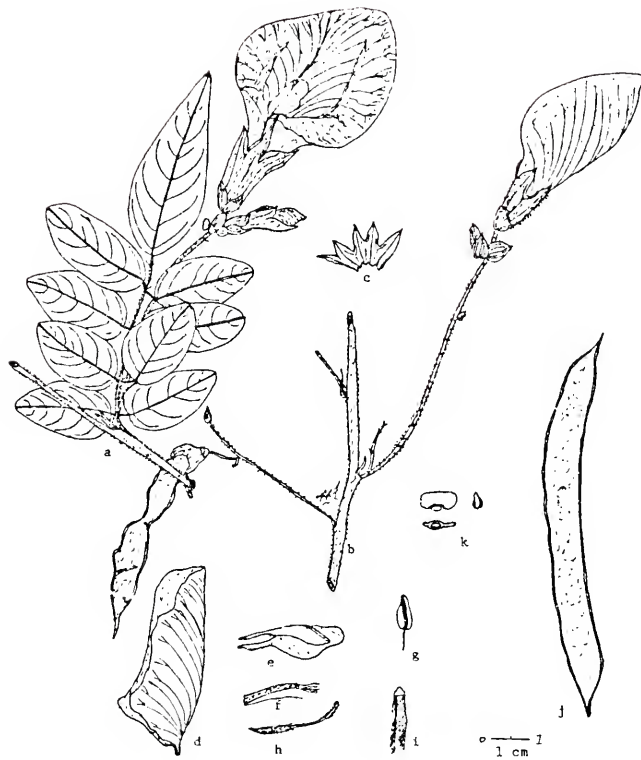
free filaments 4-7 mm; anthers lanceolate, 1.2-1.5 mm long, 0.8-1.0 mm wide. Gynophore nearly lacking, 1 mm long, 0.7-0.8 mm wide, whitish-sericeous; ovary 6-7 mm long, 1-1.3 mm wide; pubescence whitish to yellowish-white, densely sericeous; style 12-16 mm long, weakly geniculate 4-6 mm from the distal end, beard dense below stigma for 3-4 mm; stigma capitate, ca 0.7 mm in dia. Legume subsessile, linear to weakly arcuate towards apex, base cuneate, flat, ecostate, becoming weakly raised around seeds, pubescence conspicuously pilose and inconspicuously uncinat, valves 6.5-9 cm long, 9-11 mm wide; stipe 1.5-2 mm, enclosed along with base of fruit by persistent calyx; beak 4-10 mm; dehiscence by separation and spreading of valves, twisting action not observed in specimens examined. Seeds black, reniform, compressed (1 mm thick) except near center (to 2 mm thick), smooth, 4 mm long, 7-8 mm wide, 4-6 seeds per pod; hilum 3 mm x 2 mm. Figure 61.

Bojer's Clitoria is characterized as a liana with 7- to 11-foliate leaves and elongated inflorescences bearing medium-sized blue flowers.

PHENOLOGY: Bojer (1837) reported the flowering dates as November to December in Madagascar and March to April in Mauritius. Collection data of those specimens examined do not support the November-December dates. Flowering specimens were collected from April to September with fruits collected from June to September. However, those specimens collected in Mauritius lacked the collection date as well as a number of specimens from Madagascar.

TYPE COLLECTION: MADAGASCAR. Scandit in arboribus et in frutices ad margines fluviorum provincia Bé-tani-menae ora orientalis,

Figure 61. Clitoria lasciva: (a) portion of stem with leaf and inflorescence, x 1; (b) portion of older stem with flower and immature fruit, x 1; (c) calyx, x 1; (d) vexillum, x 1; (e) ala and carina, x 1; (f) androecium, x 1; (g) anther, x 7; (h) gynoecium, x 1; (i) style apex and stigma, x 6; (j) mature fruit, x 1; (k) three views of seed, x 1.  
(Bojer 76, W: a-b. Taulay s.n., W 9622: c-i. Thompson s.n., BM.)



Flo. Sep. Oct. 1830, Bojer v.76 (LECTOTYPE: W. Isolectotypes: K-hb. Bentham, M 12439).

Bentham did not designate the depository of the type specimen. The specimen in his herbarium was a duplicate from Wein which was added in 1836, but like the München specimen, lacked any data beyond "Madagascar, Bojer." Only the Wein specimen has the habitat and locality data cited by Bentham when he published Bojer's name. Bentham did not cite the collection number, a practice commonly followed in his 1837 treatment. The Wein specimen has leaves with seven, nine, and eleven leaflets as described in the original description by Bentham. The specimen in Bentham's herbarium has few leaves, and lacks 9- and 11-foliate leaves. Stafleu (1967) noted that Bentham borrowed specimens from other institutions on loan, and that his types may be in other institutions besides Kew. The Wein specimen was probably examined by Bentham on loan because it is a better match to the original description, and bears the cited collection data. Thus, it was selected as the lectotype instead of the specimen in Bentham's herbarium.

The Helsenberg collection deposited at the British Museum may be a duplicate of the type collection. There are two labels. One bears the data "Hab. in prov. Be-tani-mena ins. Madagascar. Nomen madag. Vahé-bourissika quod characterem huius generis Linnaëanum bene experimit. Clitoria sp." which closely parallels the data of the type collection (W), not cited above, of "Clitoria lasciva Boj. Scandit . . . orientalis insula Madagascar. Flo. Sep. Oct. Nom. madagascariensis Vahe-m-burisika. quod Linnei characterem bone experimit." This phraseology does not occur in the literature, and

has been found only on the label data of these two specimens. The second label bears "Madagascar, Helsenberg" written in a different ink and handwriting. The British Museum specimen lacked a species name and Bojer's name in the data, which was present in the Kew and Muchen duplicates. Is this specimen a duplicate added to Helsenberg's herbarium before Bojer named the species, or is there another explanation for the close similarity in label data?

VERNACULAR NAMES: MADAGASCAR: Vahe-m-burisika, Bojer v.76; Vahe-bourissika, Helsenberg s.n.; Vahytsikomba, Hochreutrier (1908); Famahyfary, Hochreutrier (1908); Fanefary, Thompson s.n.

ECONOMIC IMPORTANCE: This species is cultivated in gardens locally in Madagascar and Mauritius for its climbing habit, foliage, and the deep blue flowers.

NOTES: Clitoria lasciva appears to have its closest affinities with C. ternatea which has similar fruits and flowering structures, but is distinguished by the smaller inflorescence bearing usually one flower, the larger calyx tube, the suffrutescent habit, and fewer leaflets.

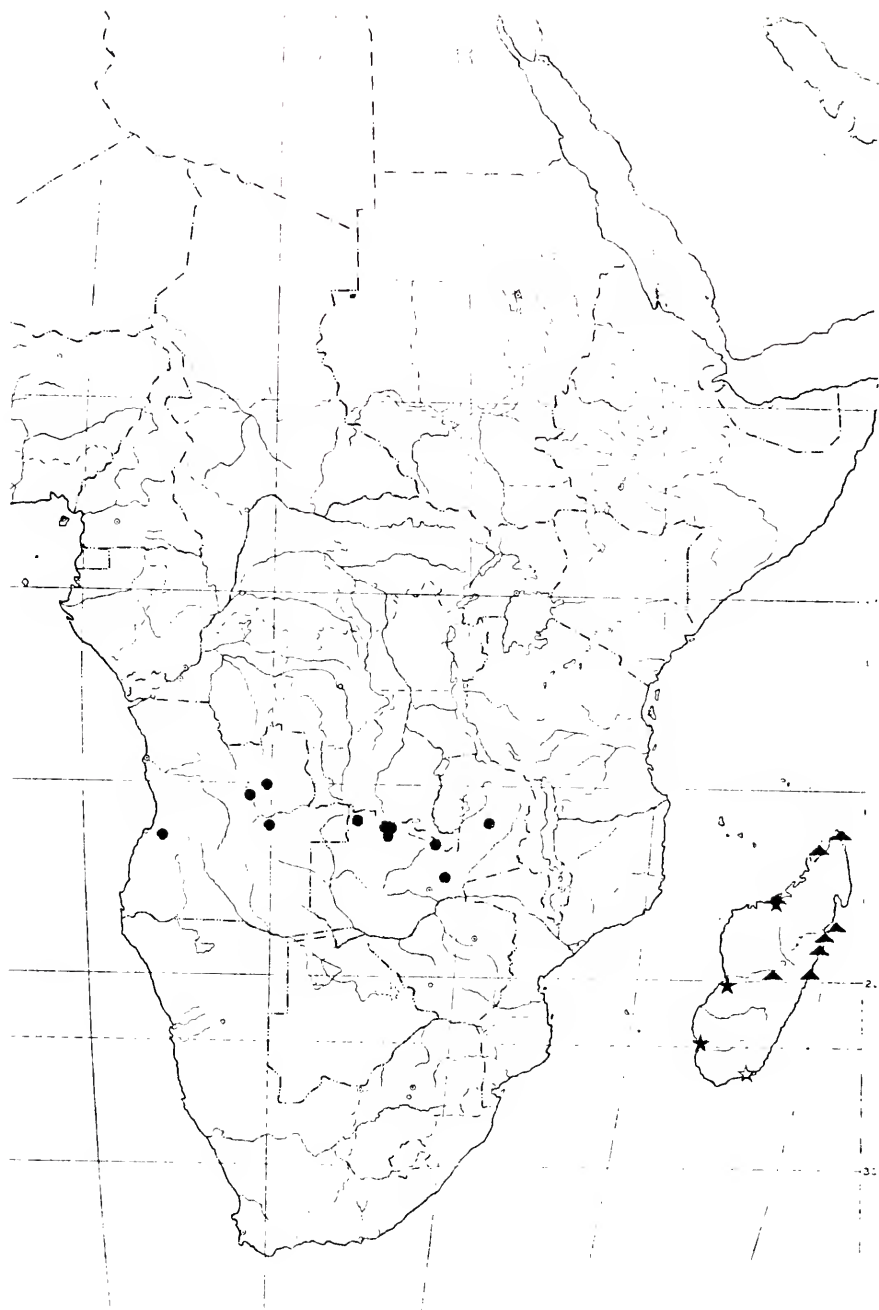
The origin of the specific epithet appears to be the Latin term "lascivus" which means "wanton" or "licentious."

DISTRIBUTION (Figure 62): Clitoria lasciva is an endemic in Madagascar found in the forested margins of rivers, and cultivated in adjacent island gardens.

M A D A G A S C A R. Belanger s.n. (G); 17 Jul 1863, Blackburn s.n. (GH,K,NY); 29 Mar 1941, Decary 1698 (K,US); Humbolt 151 (K,W); Lyall 93 (K); Aug-Oct 1838, MacWilliams s.n. (G); Thompson s.n. (BM); central Madagascar, Baron 1418 (BM,K) and 2589 (K); coast to capital,

Figure 62. African distribution of three species of subgenus *Clitoria*.  
*Clitoria kaessneri* (●); *C. lasciva* (▲); *C. heterophylla*  
var. pedunculata (★), var. heterophylla (☆).





May 1880, Kitching s.n. (K-2 sh.); Bedilo, Majunga, 27 May 1912, Afzelius s.n. (K,NY,S-2 sh.); valle de l'Ikopa, 14 Mar 1930, Decary 7534 (G-2 sh.,MO,NY,S); NossiBe, Sep 1879, Hildebrandt 3128 (BM,G-2 sh.,K,M,W); l.c., 1888, Anonymous s.n. (NY,W-2 sh.); Diego-Suarez, Jun 1887, Taulay s.n. (NY,W); l'interieur de la baie de Antongil, Maroa, 1897, Mocquery 189 (G); Isle Ste. Marie, Jun 1887, Taulay s.n. (W-2 sh.); l.c., 1846-52, Voyage Boivin s.n. (G); l.c., Boivin 1917 (G); Foulepointe, 1863, Bouton s.n. (G); Tamatave, Jul 1887, Taulay s.n. (W-2 sh.); Vatomandry, 15 Apr 1904, Guillot 112 (G-2 sh.); Massif ne Ankara, 29 Jul 1929, Decary s.n. (BM,K); Tsingy de Namoroka, 8<sup>e</sup> Reserve, 4 Apr 1933, Service Forestier, Anonymous 20 (BM); Be-tani-mena, Helsenberg s.n. (BM).

M A U R I T I U S. cult., Bouton s.n. (CGE); cult., hb. Lemann s.n. (CGE); cult. gardens only, Telfair s.n. (K).

31. Clitoria ternatea L., Sp. Pl. ed 1. 2: 753. 1753.

Flos clitoridis ternatensibus Breyn., Cent. 76, t. 31.

1678; nom. illeg.

Phaseolus foliis pinnatis Riv., Terr. 40. 1691; nom. illeg.

Phaseolus indicus glycyrrhyzae foliis, flore amplo,

caeruleo, pleno Comm., Hort. Med. Amstel. 1: 47, t. 24.

1697; nom. illeg.

Phaseolus indicus caeruleus, glycyrrhizae foliis alatis,

flore amplo, clitorio Pluk., Alm. 294. 1700; nom.

illeg.

Ternatea flore simplici, caeruleo Tourn., Mem. Math. Phys.

Acad. Roy. Sci. Amsterdam 105. 1706; nom. illeg.

Ternatea flore simplici albido Tourn., l.c.; nom. illeg.

Ternatea flore pleno, caeruleo Tourn., l.c.; nom. illeg.

Flos clitorius, flore caeruleo Burm., Zeyl. 100. 1737;  
nom. illeg.

Flos clitorius, flore albo Burm., l.c.; nom. illeg.

Clitoria foliis pinnatis L., Hort. Cliff. 360. 1737; nom.  
illeg.

Flos coeruleus Rump., Amb. 5: 56, t. 31. 1747; nom. inval.

Clitoria foliis pinnata L. β Flos clitorius, flore alba  
(Burm.) L., Fl. Zeyl. 130. 1747; nom. illeg.

Clitoria ternatea L., Hort. Upsal. 214. 1748; nom. inval.

Ternatea flore simplici, caeruleo Tourn. ex Mill., Gard.

Dict. ed. 4, 3: TERNATEA. 1754; nom. illeg.

Ternatea flore simplici, albido Tourn. ex Mill., l.c.; nom.  
illeg.

Ternatea flore pleno, caeruleo Tourn. ex Mill., l.c.; nom.  
illeg.

Clitoria ternatensium Crantz, Inst. Rei. 2: 59. 1766.

Lathyrus spectabilis Forsskal, Fl. Aeg. 135. 1775.

Clitoria ternatea L. β eadem foliolus obtusioribus, flore  
albido Lam., Ency. Bot. 2: 50. 1786; nom. illeg.

Clitoria bracteata Poir. in Lam. Ency. Bot. Supp. 2: 301.  
1811.

Ternatea vulgaris H.B.K., Nov. Gen. 6: 415. 1823.

Clitoria ternatea L. β bracteata (Poir.) DC., Prod. 2: 234.  
1825.

Nauchea ternatea Desc., Mem. Soc. Linn. Par. 4: 8. 1826.

Nauchea ternatea Desc. var., l.c.; desc. var., nomen nullus.

Nauchea bracteata Dupuis ex Desc., l.c. 4: 11.

Clitoria ternatea L.  $\alpha$  coeruleo Sweet., Hort. Brit. 2nd ed.

140. 1830. nomen nudum.

Clitoria ternatea L.  $\beta$  alba Sweet, l.c.; nomen nudum.

Clitoria ternatea L. flore pleno alba Wall., Cat. Herb. Ind.

185 no. 5344K. 1831-1832; nom. illeg.

Clitoria pilosula Wall., l.c. 186 no. 5347; nomen nudum.

Clitoria parviflora Raf., Atl. Journ. 1(4): 147. 1832.

Clitoria ternatea L.  $\alpha$  flo. alba Boj., Hort. Maurit. 91.

1837; nom. illeg.

Clitoria ternatea L. A. fl. atrocoeruleo Hasskarl, Cat.

Hort. Bog. Alt. 275. 1844; nom. illeg.

Clitoria ternatea L. B. fl. coeruleo Hasskarl, l.c.; nom.

illeg.

Clitoria ternatea L. C. fl. coeruleo pleno Hasskarl, l.c.;

nom. illeg.

Clitoria ternatea L. D. fl. albo Hasskarl, l.c.; nom.

illeg.

Clitoria ternatea L.  $\beta$  albiflora Voigt, Hort. Calcuttensis

213. 1845.

Clitoria ternatea L. var. major Burnett, Pl. Util. 2: 84.

1847.

Clitoria pilosula Wall. ex Benth., Journ. Linn. Soc. 2: 37.

1858.

Clitoria zanzibarensis Vatke, Oestr. Bot. Zeitschr. 28: 261.

1878.

Clitoria ternatea L. var. pilosula (Wall. ex Benth.) Bak.

in Hook. Fl. Brit. India 208. 1879.

Clitoria coelestris Sieb. & Voss., Vilm. Blum. 1: 208.

1894; nomen nudum.

Clitoria tanganicensis Micheli in Dur. & DeWild, Bull. Soc.

Roy. Bot. Belg. 36(2): 60. 1897.

Clitoria albiflora Mattei, Boll. Bot. Palermo 6: 97. 1908.

Clitoria ternatea L. var. angustifolia Hochst. ex Bak. f.,

Leg. Trop. Afr. 428. 1929.

Clitoria mearnsii DeWild., Rev. Zool. Bot. Afr. 13, Supp.

Bot. 8: 8. 1925.

Clitoria tanganyicensis Micheli err. cal. Bak. f., Leg.

Trop. Afr. 429. 1929.

Clitoria ternatea L. var. alba Berhaut, Fl. Senegal 47.

1954; nom. illeg.

Clitoria ternatea L. var. angustifolia Hochst., nom. in

sched.

Clitoria ternatea L. var. bracteis ovata Schimper, nom. in

sched.

Clitoria ternatea L. var. flore albo Aiudie, nom. in sched.

Clitoria ternatea L. var. stenophylla Welw., nom. in sched.

Clitoria ternatea L. f. stenophylla Welw., nom. in sched.

Clitoria pinnata, nom. in sched.

Clitoria serrulata B.G., nom. in sched.

Clitoria timoriana, nom. in sched.

UNVERIFIED SYNONYMS: A number of additional names have been synonymized in the literature with this species. All names are pre-Linnaean with abbreviated citations. The authors of these names and the title of the publication are presently not clear. Burmann (1737) included all of these references with a few cited in later publications by other authors.

Clitorius flos albus, H.L. Bat. 162.

Clitorius zeylanicus, flore coeruleo, Hort. Catal.

Faba purgatrix CATHARODU Zeylonensibus Grim., Laba. Ceyl. 124.

Flos clitoridis ternatensium, Amm. Char. Pl. 62,394.

Galea Phaseoloides Zeylandica, flore albo, Mus Zeyl 32.

Phaseolus adfinis, Glycyrrhizae Germanicae foliis, orientalis,  
flore amplo coeruleo, Par. Bat. Pr. 364.

Phaseolus Indicus, Glycyrrhizae foliis, flore amplo caeruleo,  
H. Amst. 47.

Phaseolus Indicus, purgans, seu Galega Phaseoloides Zeylonica,  
flore coeruleo, Mus Zey. 10,31.

Phaseolus Zeylandicus, purgans, flore albis, Mus Zeyl. 61.

Perennial suffrutescent herb growing as a bush or more commonly with a suberect base, branches trailing and intertwining to form tangled mats, or climbing, twining, to 5 m long. Stems terete, slender, 1-3 mm thick, weakly striate, much branched near woody base, infrequently branched above, pubescence strigose, densely on juvenile stems becoming scattered then glabrate with age; internodes usually 5-15 cm, pith hollow. Leaves 5- and 7-foliate, rarely with 3-foliate leaf, membranaceous, green to silvery green, polymorphic in shape;

leaflets ovate, elliptic, obovate-elliptic, ovate-elliptic, oblong, oblong-lanceolate, or oblong-linear, apex obtuse or acute, more or less mucronate, sometimes retuse to emarginate, base cuneate to broadly cuneate or rotund, midrib weakly raised above and prominently raised below, primary nerves of 5-6 pairs to 7-9 pairs in elongated leaflets, marginal nerve often strigose-pubescent, upper surface with very short trichomes, strigose-pubescent or glabrate, and with microscopic uncinata trichomes, usually denser on narrow, elongated leaflets, confined more toward midrib and sometimes the major nerves (or nearly lacking) on broader, ovate-shaped leaflets, lower surface strigose, moderate to scattered and confined mainly to the major nerves, trichomes short, uncinata trichomes inconspicuous and scattered, lamina 1-5 (7) cm long, (0.4) 1-3 cm wide. Petioles 1-4 cm, shorter than the rachis, sulcate above, weakly striate; strigose-pubescent; rachis 2-7 cm, caniculate above, pubescence and striations similar to petiole, internode segments 1-2.5 cm. Petiolules subquadrangular, 1-3 mm long, uncinata-pubescent and moderately densely strigose. Stipules persistent, linear, 4-10 mm long, 0.5-1 mm wide; pubescence uncinata and sparsely strigose, strigose-ciliate; stipels persistent, 1-3 mm long, acicular, reduced to a nerve, inconspicuous, uncinata-pubescent with very sparse-appressed trichomes. Inflorescence axillary, solitary, reduced to a short peduncle bearing one flower at its apex, occasionally biflowered, rarely fascicled or racemose with 4-6 flowers; peduncle 0.3-1.5 cm long, glabrous to sparsely strigose. Pedicel 3-6 mm long, usually borne laterally from peduncle apex or occasionally terminally, straight or often bending at swollen base to form an obtuse to right

angle with peduncle, moderately dense-strigose and uncinata-pubescent. Bracts 2, apparently the outer pair, ovate to lanceolate, acuminate to acute, spreading-ascending or weakly concave and appressed to pedicel when pedicel is terminally located, 2-4 (5) mm long, 1 mm wide, pubescence uncinata and more or less strigose, ciliolate. Bracteoles very conspicuous, (4) 6-11 (15) mm long, (4) 6-11 (15) mm wide, membranaceous, translucent, broadly ovate to nearly orbicular, shorter than calyx tube to subequalling the calyx length and hiding it, appressed to calyx, deciduous by fructification, apex sometimes apiculate from central nerve, major nerves prominently raised, palmate, pubescence uncinata and sparse strigose, ciliolate.

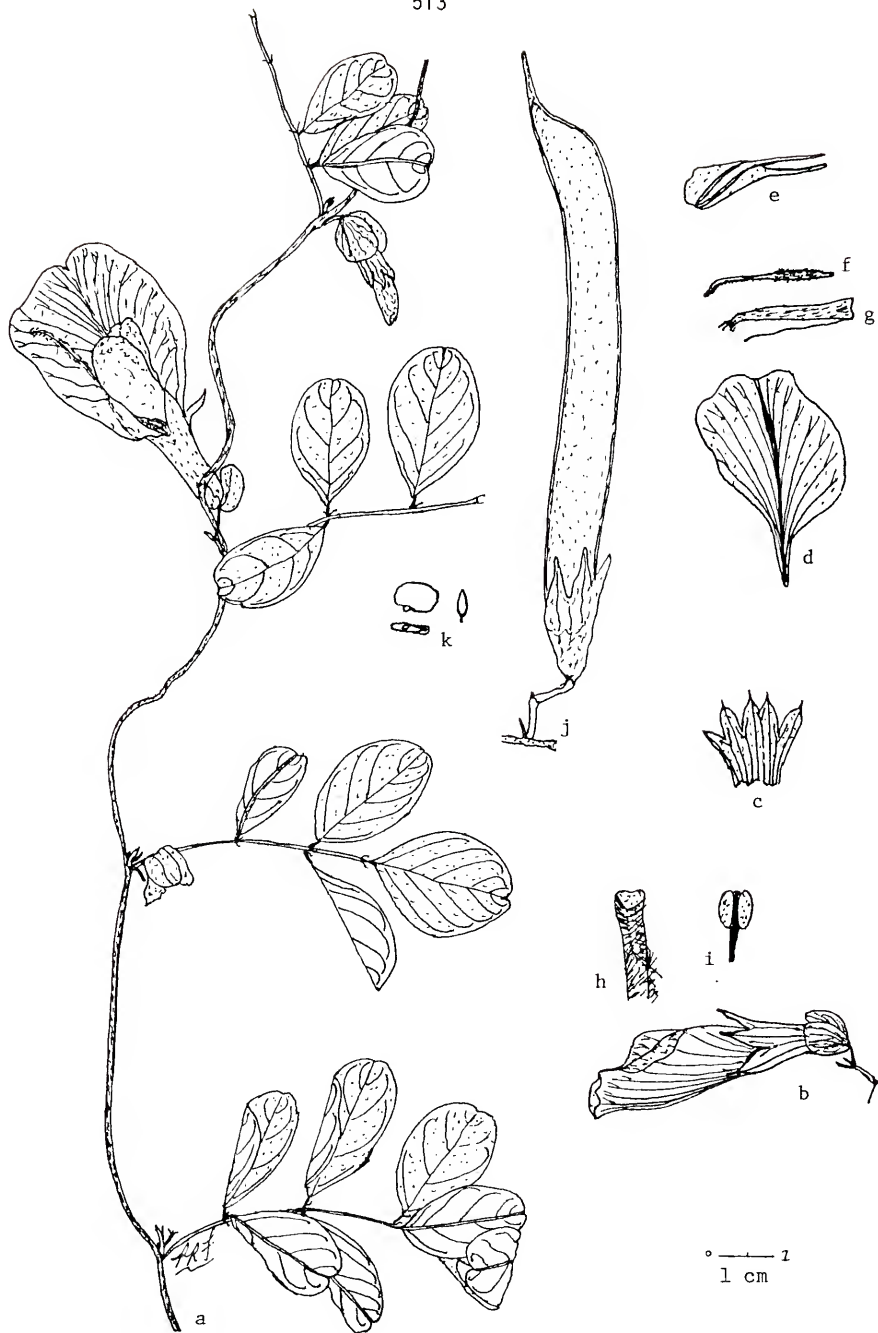
Flowers showy, pale blue to azure to violaceous, or white (sometimes fading yellowish in dried state), or white with thin edge of blue peripherally, (3) 3.5-5.5 mm, usually papilionaceous, rarely producing "double" actinomorphic flowers. Calyx subpellucid, more or less 10-nerved with a nerve extending to the apex of each lobe and a nerve to each sinus where it dichotomizes sending an inconspicuous to somewhat conspicuous branch marginally into adjacent lobes, pubescence uncinata with sometimes appressed trichomes near the nerves (especially ventral nerves), tube 8-14 mm long, 3-4 mm wide near base expanding to 6-9 mm wide at the throat, shriveling and shrinking slightly with age, lobes oblong, apex rounded with excurrent nerve of 1-2 mm, lobes 7-12 mm long, 3 mm wide at base. Vexillum pubescence uncinata and strigose dorsally, medially white or yellow in throat with blue to violaceous pigments distally, occasionally greenish-white medially and white peripherally, 2-4 cm wide, claw minute, 2-4 mm. Alae extended well beyond carina by 6-10 mm, blade white or bluish,



17-28 mm long, 7-13 mm wide, claw 7-11 mm. Carina falcate, 7-10 mm long, 4-6 mm wide, claw 14-18 mm. Stamens diadelphous (cf. double flowers below), vexillary stamen nearly free, tube nearly straight, 16-20 mm long, incurved slightly last 3-5 mm, free filaments 3-4 mm; anthers lanceolate, 1-1.5 mm long, 0.6-0.9 mm wide. Gynophore 1-2 mm; ovary 6-9 mm long, 1-1.5 mm wide; pubescence appressed, dense, white; style 14-17 mm long, base pubescent like that of ovary, bearded toward apex, densely pubescent under stigma; stigma capitate, ca 0.7-0.8 mm in dia. ACTINOMORPHIC (DOUBLE) FLOWERS: Corolla azure to dark blue, rarely white, 5-merous, all petals vexillary-like, actinomorphic. Stamens ten, all free or infrequently with some free and others fused in two or three fascicles (e.g., 5 + 3 + 1 + 1; 3 + 2 + 5 free; 3 + 2 + 2 + 3 free). Legume subsessile, yellowish-green to green becoming light brownish to tan in dried state, flat, ecostate, two thickened sutures, valves linear-oblong to oblanceolate, nearly straight to weakly curved towards apex, margins sometimes wavy, infrequently minutely serrulate, pubescence short, strigose to spreading, and uncinat, typically (5) 7-11 cm long, 8-11 mm wide, rarely only ca 2.5 cm x 4-5 mm; stipe enclosed along with legume base within persistent calyx, 1-2 mm; beak 2-6 mm; dehiscence causing valves to twist 1-3 turns. Seeds brown turning black, smooth, subreniform, compressed, 1.5-2 mm thick, 4-5 mm long, 5-6 mm wide, 7-10 seeds per pod; hilum broad elliptic, 1 x 0.8 mm. (Figures 63, 64, and 65).

The specific epithet of C. ternatea refers to the Moluccan Island of Ternate from which the earliest known collection of the species was reported by Breyne in 1678. The epithet has no relationship with the

Figure 63. *Clitoria ternatea* - I. Var. *ternatea*: (a) habit, x 1; (b) flower, x 1; (c) calyx, x 1; (d) vexillum, x 1; (e) ala and carina, x 1; (f) gynoecium, x 1; (g) androecium, x 1; (h) style apex and stigma, x 10; (i) anther, x 7; (j) fruit, x 1; (k) three views of seed, x 1. (Zambrano 105, FLAS 125537: a,c-k. Lea 12, K-200: b.)



morphological term "ternate" which denotes that the leaves are compound with three leaflets. The Ternate Clitoria is characterized as a suffrutescent perennial herb with twining, trailing to climbing stems bearing 5- and 7-foliate leaves, and bearing short inflorescences with solitary, azure or white flowers which quickly mature into elongated, flat fruits.

PHENOLOGY: This species is a profuse bloomer and seed producer. Flowers and fruits are typically collected together, both collected in every month of the year with no apparent seasonal peaks except that collections made in August are limited.

TYPE COLLECTION: INDIA. Suratt, Anonymous s.n. (LECTOTYPE: LINN 902.1-microfische seen). CEYLON: Hermann 3:13 and 3:20 and 4:49 (Syntypes at BM, not seen).

Linnaeus (1753) published four species of Clitoria in his "Species Plantarum" listing C. ternatea as the first species. Clitoria ternatea has been the only species of these four recognized in the literature as the type species for the genus. Britton and Brown (1913) were the first to designate C. ternatea as the type species, followed by Britton and Millspaugh (1920) and Hitchcock and Green (1929). The author of this study agrees with their selection. Only two of the four species were cited in earlier Linnaean works prior to 1753, C. ternatea and C. brasiliiana (the latter now recognized as a species of the genus Centrosema). Both species were included by Linnaeus (1737a) when he originally described the genus based upon Tournefort (1706) and Dillenius (1732). Examination of these two publications would indicate that Linnaeus based his generic description upon Tournefort's genus Ternatea which included three species, each

presently included within the species C. ternatea as subspecific taxa. Examination of the generic description published by Linnaeus would indicate that key characteristics such as the "tubular calyx," "carina shorter than the alae," and "subreniform seeds" agree with C. ternatea but not with C. brasiliiana which has a campanulate calyx, carina nearly equal to the alae, and ellipsoid-cylindric seeds. Evidence indicates that C. ternatea was the species upon which Linnaeus described the genus Clitoria, and thus the type species.

For purposes of typification, Stearn (1957) divided Linnaean species into four groups. Clitoria ternatea can be assigned to his fourth group: "species based on several elements, of which one is to be taken as the lectotype." Each of these elements would be syntypes. Gillett, Pohill, and Verdcourt (1971) reported three Hermann collections (3:13, 3:20, and 4:49) from Ceylon as syntypes, now deposited at the British Museum of Natural History. Stafleu (1967) reported that Hermann specimens were a part of the Burmann Herbarium of Ceylon which Linnaeus helped arrange and annotate. A fourth syntype element would be the specimen in the Linnaean Herbarium from Surat, India. Savage (1949) reported that the handwriting on this specimen of C. ternatea was that of Linnaeus. A fifth possible syntype element would be the illustration (Table 31) published by Breyne (1678) which accompanied a detailed description of Flos clitoridis ternatensibus (= C. ternatea), the earliest known record of the species. Tournefort (1706) based his genus Ternatea upon the Breyne element, and in turn, Linnaeus later based his generic description of Clitoria upon Tournefort's genus. Linnaeus (1737a, 1737b, 1748, 1753) cited Breyne and thus had studied the illustration

and its accompanied description, but there is no evidence as to whether he had studied the specimen upon which the description and illustration was based. This specimen may be deposited with the Breyne Herbarium at Leiden, although this has not been confirmed.

Stearn (1957) indicated that the most important element in Linnaeus's protologue was the Linnaean phrase-name. He noted that "Linnaeus based the phrase-name nearly always on a specimen or an illustration seen by him, for he distrusted the descriptions of others, and the phrase-name is thus likely to give a significant indication of his intent; certainly he would never have chosen an element disagreeing with the phrase-name to typify his species." Linnaeus consistently used the phrase-name "Clitoria foliis pinnatis" for C. ternatea. In two of his earlier works, Linnaeus (1737b, 1747) included Rivinius's name "Phaseolus foliis pinnatis," a possible source for the Linnaean phrase name. Yet Linnaeus did not include Rivinius's name in his Hortus Upsaliensis (1748) and Species Plantarum (1753) while he continued to include Breyne, Tournefort, and most of the others whose names were based upon these earlier authors. If Linnaeus had taken his phrase-name from Rivinius's element, it is doubtful that Linnaeus would have excluded Rivinius's reference while retaining nearly all others. It is more probable that Linnaeus recognized that C. ternatea was the only one of the four Linnaean species that has 5- and 7-foliate leaves, whereas the other three species are all 3-foliate, thus easily recognized by its leaflet number. The other three species all include in their phrase-names, the phrase "Clitoria foliis ternatis . . .," a phrase lacking in any element that Linnaeus included with those species. Thus in this

particular case, it does not seem probable that the Rivinius element would be considered as a syntype, as there is no evidence that Linnaeus examined anything other than a description.

In the selection of the lectotype, there seemed to be five probable syntypes from which to choose. Three elements were from Ceylon, one element from India, and the last element was from the Molluccan Island of Ternate. In his protologue, Linnaeus (1737b) reported the localities as Malabar (Southwest India), Zeylona (Ceylon), and Ternate. In his Hortus Upsaliensis (1748) and his Species Plantarum (1753) protologues, Linnaeus cited only India. Since Linnaeus had the Indian element primarily in mind as evidenced by the change in his treatments, the specimen in the Linnaean Herbarium (no. 902.1) from Surat, India, was chosen as the lectotype from among the probable syntypes.

VERNACULAR NAMES: North America: UNITED STATES: Blue Pea (Florida), Small (1933). MEXICO: Caracolito (Chipas), Hernandez 1013: Escuintla (l.c.), Matuda 16425; Manga de nino (Jalisco), Mexia 1070; Zapotillo (Vera Cruz), Rosas 663; Zapatico de la reina, Butterfly pea, Pigeon wings, Conchitas, and Papito (l.c.), FAO-68. EL SALVADOR: Zapatillo de la reina, Standley 20595 and Standley (1928, 1931, 1937). GUATEMALA: Diego, Steyermark 29160 and Standley (1946); Concha blanca (Petén), Standley (1946). PANAMA: Campanilla, Standley (1928, 1931).

Caribbean Islands: CUBA: Frijolito, Schott 114; Conchita azul, Conchita blanca, and Manto de vieja, Léon (1951). BAHAMAS: Blue pea, Britton (1920). BERMUDA: Blue pea, Britton (1918). CAYMAN ISLANDS: Bluebell, Kings 63 and Proctor 15182. JAMAICA: Blue pea, Adams

(1972). PUERTO RICO: Bejuco de Conchitas, New York Academy of Science (1924), Standley (1928), and Stahl (1936); Papito, New York Academy of Science (1924) and Standley (1928). GUADELOUPE: Pois savane, Pois marron, Pois sauvage, Pois tonnelle, Pois-pois, and Lentille sauvage, Stehle & Quentin (1948). MARTINIQUE: Pois hallier, Stehle 3484 and 3520. BARBADOS: Blue vine, Goodwis 106. TRINIDAD: Blue pea, White pea, Freeman (1951). CURACA0: Jerba dipalomba, Anonymous 806 (U); Tapata di la reina, Arnoldo 1809. FRENCH ANTILLES: Pois-savane, Duss (1897).

South America: VENEZUELA: Zapatico de la reina, Domínguez s.n., Eliás 270 and 481, Zambrano 105, and Pittier (1944). BRAZIL: Cunha, Kok et al. (1943).

Africa: CAMEROUN: Blue pea, Ogu 98. ANGLO-EGYPTIAN SUDAN: Kordofan pea, Andrews (1952). ETHIOPIA: Geseziat Ogaden, and Lu-kiliale isbeak, Geover s.n. SOMALIA: Ghria hele (BM), Ghria ejee (BM), Riaegee (K), and Riahele (K), Glover & Gilliland 140; Fifirole, Tuckard 108; Salbocole, Mattei (1908). ZAIRE: Lozanghe, Madezu, Zinzanghi (Boma), and Laku (Mahagi), Wilczek (1954). UGANDA: Karimi kamwe (Lungomkila), Purseglove 406. KENYA: Auk-egelai, Mathew 6389. TANZANIA: Chugu ndo, Davis 54; Ihojo (Kisukuma), Tanner 1429. MAURITIUS: Liane madame, and Liane Ternate, Bojer (1837).

Western Asia: IRAQ: Hab al zherate, Rustin Exp. Farm 10087. ARABIA: Moglagidi, Schweinfurth 260. PERSIA: Bikhe-hayat, Chopra et al. (1949). ARABIC: Bazrul-mazariyune-hindi, and Mazariyune-hindi, Chopra et al. (1949).

India: Aparajita, Tiwari & Gupta (1959); Butterfly pea, Chopra et al. (1949) and Sen (1961); Chandra kanta, Katiyar et al. (1970);



Mussel-shell creeper, Chopra et al. (1949) and Sen (1961); Bhoovera, and Kájali, Nairne (1894); Gokarni, Maheshwari (1963) and Nairne (1894); Neel-aparajita, and Shwet-uparajita, Voigt (1845); Sanka-gida (Ingolis), Hohenacker 117. BENGAL: Aparajita, Chopra et al. (1949) and Kirtikar & Basu (1918); Nil-aparajita, Swet-aparajita, and Uparajita, Chopra et al. (1949). BOMBAY: Gokaran, and Kajali, Chopra et al. (1949) and Kirtikar & Basu (1918); Gokarna, Supli, Chopra et al. (1949). DECCAN: Ghutti, Kalizer, and Phiki, Chopra et al. (1949). GUJERAT: Garani, Chopra et al. (1949) and Kirtikar & Basu (1918); Koyala, Chopra et al. (1949). HINDI: Aparajit, Chopra et al. (1949, 1958); Kalina, Kava-thenthi, and Visnukranti, Chopra et al. (1949) and Kirtikar & Basu (1918); Aparajita, Kajina, Kalizer, Khagin, Kova, Kova-theti, and Shobanjan, Chopra et al. (1949). KANARESE: Gokarna-mul, Kirgunna, and Vishnu kantisoppu, Chopra et al. (1949) and Kirtikar & Basu (1918); Girikarni-balli, and Sankhapushpa-balli, Chopra et al. (1949). KONKANI: Kazuli, Chopra et al. (1949). MARATHI: Gokaran, Gokarni, Gokurna, Kajili, and Sholonga, Chopra et al. (1949). PUNJAB: Dhanattar, Kirtikar & Basu (1918). PUSHTU: Aparajita, Aparajit, Dhanattar, and Ghiria, Chopra et al. (1949). SANSKRIT: Aparajita and Asphota, Chopra et al. (1949, 1958) and Kirtikar & Basu (1918); Gokarnamul, Khurne, Nilaghiria, Nilaghirie kurni, and Vishnukranta, Chopra et al. (1949). TAMIL: Kakkanam-kodi, Chopra et al. (1949) and Kirtikar & Basu (1918); Kakkanam, Kakkattan, Kanni-kodi, Karakartan, Karisanni, Karkakartum, Karkurattai, Karudakkovai, Karundattondai, Karuvilai, Kaurigeni, Kavalai, Kemachi, Kevari, Kigini, Kiriganni, Kiruttini, Minni, Taruganni, Uyavai, and Viranu, Chopra et al. (1949). TELUGU:

Dintana, Dintena, Mella, Nalla-ghentana, Nalla-vusinitige, Niladintana, and Tella-dintana, Chopra et al. (1949). TULU: Sanka, Chopra et al. (1949). URDU: Mazeriyuni-hindi, Chopra et al. (1949). URIYA: Onasi and Oporajita, Chopra et al. (1949).

Ceylon and Southeast Asia: SRI LANKA (CEYLON): Kata-rodu, Deschamps 2; Katarodu-wel s, deSilva 87; Kataroduwaël, Burmann (1737); Katarodu (white), Burmann (1737); Catharodu, Burmann (1737); Katte roddoe, Burmann 74 and Schlechtendal (1830); Nil-kata-rolu s, deSilva 98; Siel catta kodoe, Burmann 75. BURMA: Bukiyu, Bukyu, Oung mai phyu, and Pai nong ni, Chopra et al. (1949); Pe-nauk-ni and Aung-mai-phyu, Hundley & Koko (1961). THAILAND (SIAM): Aug chan, Kirtikar & Basu (1935). MALAYASIA: Bonga biru, Burmann (1737) and Rhumpf (1747); Bunga biru, Burkill (1935); Bonga calente, Rhumpf (1747); Kachang telang, Ridley (1922) and Burkill (1935); Kakkanan, Chopra et al. (1958); AraI, Kakkanam-koti, Sankhankuppi, Sankhapushpam, and Sholongo-kuspi, Chopra et al. (1949).

Phillipines and Indonesia: PHILLIPINES: Balog-bálog (C. Bis.), Giting-princésa (Bik.), Kolokánting (Tag.), Kalompági (Ilk.), Pukiñggan (Tag.), Samsampín (Pang.), and Samsanping (Ilk.), Merrill (1923); Calocantíng (T.), Colocantíng, and Puquiñgang (T.), Merrill (1903). SUMATRA: Inggir ingir, Jungle lau bakal, and Kampoeng Singgadanik (Karo-land), Barlett & LaRue 168. CHRISTMAS ISLAND: Bunga biru (Malayan), Powell 13. JAVA: Bonga biru, Burmann 256; Kembang télang, Kembang télang bódas (white), Kembang télang buláu (atro-coeruleo), Kembang télang buláu ad múda (coerulea), and Kembang télang súsun (pleno), Hasskarl (1848); Kembang téléng and Méntéléng, Burkill (1935). TERNATE: Bokyni Cotele de Principisse Clitoris,

Breyne (1678); Saja cotele, Bokyma cotele, and Fula Criqua (Port.), Rumpf (1747).

Australia and Pacific Islands: AUSTRALIA: Butterfly pea, Hassell (1945) and Gardner and Bennetts (1956). FIJI ISLANDS: Kau yalewa, Smith 1028; Thanga balangi, Parham 51. TONGA: Paipa, Yuncker 15810. POLYNESIA: Liane (Uahuka), Brown (1935). HAWAII: Butterfly pea, Inafuku s.n.

General vernacular names, horticulture: Butterfly pea, Uphof (1968); Mussel-shell creeper, Lowis (1878); Wing-leaved Clitoria, Brown (1814).

ECONOMIC IMPORTANCE: Clitoria ternatea is the most economically important species within the genus because of its widespread distribution and easy availability, with reported uses in the literature dating back to 1678. This species has been prized as an ornamental, is reported to have several medicinal and aphrodisiacal properties, and has recently been noted by researchers as a promising forage crop in the tropics. It is also a useful species in some geographical areas as a food and as a dye. Clitoria ternatea was fully treated with specific literature references in an introductory chapter (see chapter "Economic Importance" for details). A brief summary of economic uses (excluding horticultural) reported by collectors are as follows:

Medicinal: Root a purgant medicine or remedy (Martinique), Hahn 234; Roots pounded and fed to children of the Sukuma tribe that have constipation (Tanzania), Tanner 1429; Roots are chewed for lung and throat complaints (Anglo-Egyptian Sudan), Pritchard 4. Aphrodisiac: Before a cow is sent to the bull, a root is chewed and blown up her

nostrils to insure her fertility (Anglo-Egyptian Sudan), Pritchard 4.  
Dyes: Used in dyeing (Mozambique), Chase 2815; Malaya kompons,  
 flowers used for coloring cakes and rice (Christmas Island), Powell  
 13. Forage: Legume cherished by goats (Ethiopia), Iecama I-81;  
 Young pods especially eaten by goats and gazelles (Kenya), Mwangangi  
& Gwynne 1251; Bees are attracted to the flowers (Kenya), Mwangangi &  
Gwynne 1251.

NOTES: There are several descriptions of C. ternatea which report that the leaves are rarely 9- and 11-foliate, or include 9-foliate leaves along with the more common 5- and 7-foliate leaves. These descriptions are more common in some of the floras (e.g., Jamaica, Fawcett and Rendle 1920; Trinidad and Tobago, Williams, 1931; Suriname, Amshoff, 1939), probably because they based their description of the species in part upon the earlier revision of Clitoria by Bentham (1858) who reported the higher leaflet number, noting that nine or eleven leaflets were rarer. Bentham's revision included a slight change from his description of C. ternatea in 1837 in which he reported the leaflet number as six (probably an orthographic error as even-pinnate leaves have never been reported for the genus) to eleven. Don (1832) was possibly the first to report nine leaflets for this species. Examination of the specimens of this species failed to reveal any example of nine or eleven leaflets, although rarely 3-foliate leaves were observed at the lowest nodes of seedlings and rarely at an upper node. The 9- and 11-foliate leaves were on a few specimens of C. lasciva from Madagascar which were misidentified as C. ternatea. Clitoria ternatea has commonly 5- and

7-foliate leaves (ca 2-3:1 ratio). Reports of higher leaflet numbers for this species are in error.

Double-flowered specimens of C. ternatea have been reported infrequently in the literature since Commelin (1697). Most authors reported these variants as cultivars which did not set seed. Many of the specimens examined were cultivars, but additional specimens indicate from the collector's data that spontaneous growth can occur. Mature fruits were present in a few collections. Saroja (1961) reported fertile pollen and larger size pollen grains, and Sen and Krishnan (1961) reported the results of their genetic studies crossing the actinomorphic flowers with the normal flowers (see chapter "Prior Research: Morphology" for fuller details), thus, these variants are capable of reproduction. Saroja (1961) is the only one to report 4-merous flowers with eight free stamens. Flowers of mounted specimens are usually glued to the herbarium sheet, and because of this and petal overlap, it was difficult to always count the petals. A 4-petaled flower was not encountered on specimens examined for this study.

There is considerable variation in a number of structures within the species, which includes the bracteole size and shape, leaflet shape, size, and pubescence of the upper surface, and flower size and color. In viewing this variation on a world-wide basis, the variation in these structures fits a somewhat consistent pattern throughout the tropics except for Africa. African specimens present a problem because many individuals are distinctly different from individuals in other parts of the world, but within Africa there is a gradient of variation in the structures noted that makes segregation difficult.

African populations need further study employing experimental techniques to gain further insight on subspecific delineations.

Recognition of these African variants from the typical concept of C. ternatea has historically produced a number of published names, mostly at the species level. Clitoria bracteata Poir. (1811) was noted for its solitary flowers, large bracteoles, and twining stems. A decade later, de Candolle (1825) reduced this species to a variety of C. ternatea, segregated from the typical variety by subscabrous leaflets, pubescent legumes, and purplish-white flowers. Berhaut's recent flora of Senegal (1954) and Hutchinson and Dalziel's Flora of Tropical West Africa (1966) do not recognize this variety. Clitoria zanzibarensis Vatke (1878) was reported to have affinities to C. ternatea but segregated by smaller flowers and leaflets, and the linear-oblong shape of the leaflet. Clitoria tanganicensis Micheli (1897) and C. mearnsii DeWild (1925) were two more names published for narrow leaflet members. Baker (1929) published Hochstetter's varietal name, C. ternatea var. angustifolia, and included Vatke's name in synonymy. This variety was distinguished by its round bracteoles and narrower leaflets. DeWild's and Micheli's names were later included by other botanists in synonymy under var. angustifolia, such as Wilczek (1954) who expanded on the characters used for segregation, distinguishing this variety by the narrow leaflets, rounded leaflet base, smaller white flowers, and smaller bracteoles. Gillett, Pohill, and Verdcourt (1971) did not recognize this variety in their flora of Tropical East Africa, and noted that the species abounds in "minor variants." Clitoria albiflora Mattei (1908) was noted as an intermediate between C. ternatea and C. tanganicensis.

Mattei's name is absent in floristic treatments (type from Somalia not within geographical areas of recent floras) and has not been used for identification of any specimen examined.

Bracteoles are typically 6-11 mm in diameter. Smaller bracteoles are usually ovate with width up to 2 (3) mm narrower than the length, becoming nearly orbicular as the bracteole size increases. In northern and western Africa, some individuals appear with huge suborbicular bracteoles, to 15 mm in diameter. These conspicuously large bracteoles hide the calyx during the bud stage, and are lacking in individuals from other tropical regions. Some members with narrow leaflets exhibit smaller bracteole length of 4-7 mm. There exists a gradient in bracteole shape and size, making this character unreliable for segregation of African specimens.

Elongated, narrowed leaflets occur only in plants from the eastern half of Africa. These leaflets are easily distinguished from those of other members from different tropical areas by their linear, oblong, or lanceolate shapes. These leaflets typically have rotund bases whereas the broader, shorter, ovate to elliptic leaflets have cuneate bases. However, there are gradients in leaf bases from cuneate to rotund, and in leaflet size from narrow to broad, short to long. Leaflet pubescence rarely has been used as a diagnostic character. Narrow leaflets have microscopic uncinata hairs present over most of the upper surface whereas broad leaflets have macroscopic trichomes appressed and scattered over the upper surface with microscopic uncinata trichomes (when present) confined to the midrib. Both pubescent forms can become subglabrate with age. Again, intermediate forms can occur.

Flowers typically fit within two size ranges. The common size is 4-5.5 cm, with smaller flower sizes, (2.5) 3-4 cm, occurring in many African specimens. Flowers are typically pale to dark blue throughout the tropics with occasionally a white-flowered form occurring. In Africa, as flowers become smaller, the white color becomes more prominent. The blue pigment conspicuous in the vexillum becomes reduced over much of the inner surface until it forms a narrow peripheral band or disappears entirely.

Examination of the African material reveals several possible subspecific types in which certain combinations of characters consistently appear within broad geographic areas. One combination present is the typical group with the large blue flowers, common bracteole type, and ovate to elliptic leaflets bearing a strigose pubescence on its upper surface. This group is found scattered throughout Africa and all tropical regions outside Africa, and includes the type specimen, thus having a name (ternatea) automatically associated with it. White-flowered members occasionally occur that agree in all other characteristics and could be treated at a lower subspecific level. A second group from Western Africa has white flowers and a conspicuously tapering apex to the leaflet. This group includes Poiret's type, and thus has a name (bracteata) associated with it. A third group, also from Western Africa, has the typical blue flowers and ovate to elliptic leaflets, but has large, conspicuous, suborbicular bracteoles. No types are included with this group, thus there is no name associated with it. A fourth group has blue flowers which are intermediate in size, a calyx consistently at the lower size range of the species, and small bracteoles, but it has



the common broader leaflet type. This group is commonly found in Northeast Africa in Somalia, Eritria, and Ethiopia. A fifth group has small whitish flowers, elongated leaflets typically subglabrate above, and the conspicuously large bracteoles. This group is common in northern East Africa, particularly in Anglo-Egyptian Sudan and Ethiopia. It includes Hochstetter's type and has the associated name angustifolia. The last African group has small whitish flowers with very narrow, elongated leaflets that have uncinat pubescence on the upper surface, and usually small bracteoles. This group is common in Eastern Africa from Mozambique to Kenya, and includes several types of which the earliest name is zanzibarensis.

In making keys to these groups and applying it to the African specimens, it became very difficult to segregate the collections into the six groups as briefly described. Too many exceptions occurred each time the keys were revised because the characters used proved unworkable. Bracteole characteristics proved the most unreliable as occasionally both the typical and large bracteole types were present on the same individual, and more commonly on different individuals of the same collection. The range of smaller bracteoles consistently overlapped the lower end of the range for the typical bracteole size. Finally bracteoles were eliminated as a segregating character, which consolidated group three with group one and made segregation of group five from group six difficult. Likewise group two was consolidated with group one because of the consistent gradient in leaflet apices from a tapering to an obtuse apex. Group four was united with group one because the specimens of group four were collected with slightly immature flowers. Comparison with other specimens having larger

flowers revealed that the flowers of group four agreed with the smaller flowers found on the individual that also had the common, larger blue flowers. With the elimination of bracteoles as a diagnostic character, there remained only the leaflet width and pubescence on the upper surface as characters which distinguished groups five and six. These characters, however, proved unreliable for segregation because of the continuous gradient present for the characteristic. Thus the two groups were combined into one.

The two newly consolidated groups are treated as varieties noting that there are a number of variants that can occur within each one. These varieties are segregated by six characteristics, which include leaflet shape, leaflet length/width ratio, leaflet pubescence on the upper surface, leaflet width, flower length, and flower color. Most specimens are easy to identify because of the particular combination of the characteristics they possess. There are a number of specimens, however, which exhibit intermediate characteristics, or the characteristics are difficult to interpret. Specimens with conspicuously narrowed leaflets (less than 1 cm) or elongated leaflets (length/width ratio = 4-9) will be easily recognized as variety angustifolia. Specimens with large blue flowers (4-5.5 cm) and leaflets with a cuneate base are easily recognized as var. ternatea, as well as those specimens with large white flowers. But specimens with smaller leaves and smaller white flowers may present problems. For difficult specimens, consult Figure 64 which illustrates several examples of typical leaflets for each variety and Table 11 which provides an artificial method of identification. The upper portion of the table gives the typical characteristic found for each character

Figure 64. Clitoria ternatea - III. Var. ternatea: (a-g) typical leaflets, x 1; (y) typical leaflets, x 1; (z) flower, x1, (aa) fruit, x 1. Var. angustifolia: (i) flower, x 1; (j-x) typical leaflets, x 1. (Rao 66106, MO 2031229: a,g. Nana 6256, K-59: b,f. Roberty 11217, G-hb. Delessert: c,e,h. Heudelot 437, K-hb. Hooker: d. Glover s.n., G-hb. Delessert: i,p-q,v. Schimper 1617, MPU-31: j,m. Schimper 1736, K-hb. Hooker: k,w. Conrads 13439, K: r,x. Hildebrant 1189, K-14: s-u. Vaughan 2548, BM: l,n-o. Wallich 5347, BM: y-z,aa.)

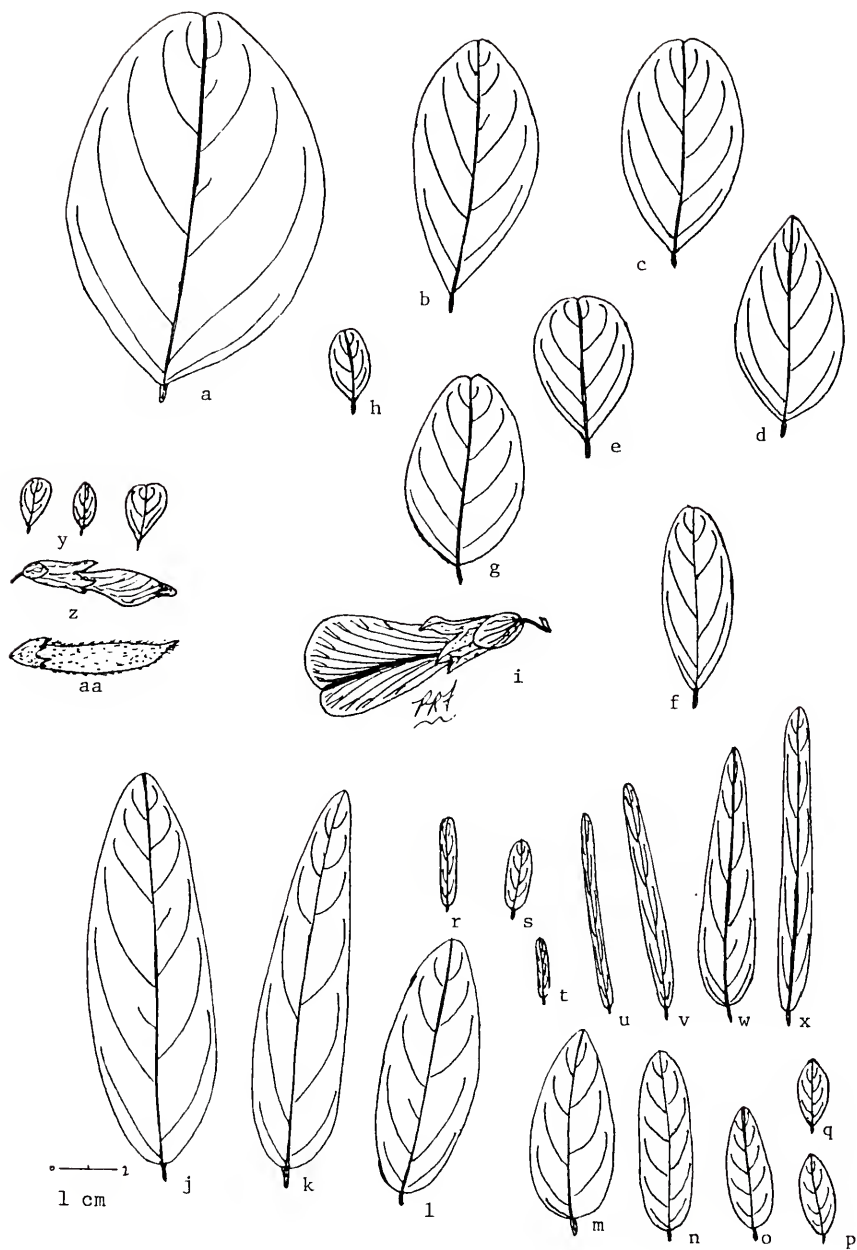


Table 11. A comparison between the two African varieties of *C. ternatea*. The upper chart summarizes the morphological differences. The lower chart gives the criteria for the assignment of numerical point values for each characteristic.

CHARACTER	var. TERNATEA	var. ANGUSTIFOLIA
A) Leaflet shape:	Ovate, Oval, Elliptic Obovate	Oblong, Narrow elliptic, Lanceolate, Linear
B) Leaflet width:	12-40 mm	4-15 (Occasionally 20) mm
C) Leaflet ratio (Length/width):	1.2-2.2 (2.5)	(2.0) 2.5-9.0
D) Leaflet pubescence on upper surface:	Short, scattered strigose to glabrate	Conspicuously uncinata to glabrate
E) Flower length:	(3.5) 4-5.5 cm	(2) 2.5-4 cm
F) Flower color:	Blue to purple (White form)	White to white with a thin blue peripheral band
Numerical Value:	6-11	13-18

<u>TERNATEA</u> Value=1	<u>INTERMEDIATE</u> Value=2	<u>ANGUSTIFOLIA</u> Value=3
A) Ovate, oval, obovate Broad elliptic (Large leaflets)	Oblong-elliptic	Oblong, Lanceolate Oblong-lanceolate Narrow elliptic (Small leaflets)
B) 40-20 mm	20-12 mm	12-4 mm
C) Ratio 1-2	Ratio 2-2.6	Ratio 2.6-9.0
D) Strigose, to scattered; Uncinate absent	Glabrate, uncinata on midrib & nerves; Uncinate with strigose sparse, marginally	Uncinate, conspicuous to inconspicuous, sparse; Strigose absent
E) 5.5-4.0 cm	4.0-3.5 cm	3.5-2.5 (2) cm
F) Blue to purple with yellow or white medially; (White if flower greater than 4 cm)	White with thin blue peripheral band; Flower color unknown	White with greenish-white medially

used in segregating the two varieties. The lower portion gives an alternative means of identification to that of the key. A value of one is assigned to each characteristic typical of var. ternatea and a value of three for each characteristic typical of var. angustifolia. Intermediate characteristics and size ranges are assigned the intermediate value of two. In using the chart, a sum of 6-11 would indicate var. ternatea and a sum of 13-18 would indicate var. angustifolia. White-flowered forms of var. ternatea (flowers large, 4-6 cm) typically totaled to a value of 9-11, although this value would drop if a value of one was assigned for the flower color when the flower size was greater than 4 cm. In applying this artificial system to the specimens examined, African collections fell into two distinct groups. The data are summarized in Table 12. All collections outside of the African tropics obtained value totals of 6-11, with few collections having a total above nine.

It is obvious from examination of the specimens that some gene flow occurs between these two groups. Additional experimental studies can provide more data upon which new taxonomic decisions may be made. With the available data, it seems that it is best at this time to recognize two African varieties as Wilczek (1954) has done because they can be morphologically distinguished, rather than treat the African members as one large polymorphic group as Gillett, Pohill, and Verdcourt (1971) have done.

DISTRIBUTION (Figures 65 to 69 and 72): Clitoria ternatea is an anthrogenic pantropical species. Originally grown as a cultivar, the species has escaped and become naturalized throughout the lower latitudes. The origin of the species is unknown, but examination of

Table 12. A comparison of the two African varieties of *C. ternatea* using the artificial numerical value system. The chart summarizes the number of collections per total point value assigned per country.

COUNTRY	var. TERNATEA							var. ANGUSTIFOLIA						
	6	7	8	9	10	11	12	13	14	15	16	17	18	
<u>Northern Africa:</u>														
Senegal	0	2	1	3	2	0	0	0	0	0	0	0	0	
Gambia	1	0	0	0	0	0	0	0	0	0	0	0	0	
Portuguese Guinea	0	1	0	0	0	0	0	0	0	0	0	0	0	
Mali	1	0	0	0	0	0	0	0	0	0	0	0	0	
Sierra Leone	0	1	1	0	1	0	0	0	0	0	0	0	0	
Ivory Coast	2	1	0	0	0	0	0	0	0	0	0	0	0	
Ghana	0	3	2	0	0	0	0	0	0	0	0	0	0	
Togo	1	0	0	0	0	0	0	0	0	0	0	0	0	
Dahomey	0	1	0	0	0	0	0	0	0	0	0	0	0	
Nigeria	1	3	3	0	0	0	0	0	0	0	0	0	0	
Cameroun	1	3	1	0	0	0	0	0	0	0	0	0	0	
Sudan	0	1	13	3	0	0	0	0	0	1	2	0	0	
Ethiopia	0	3	3	9	1	0	0	3	0	1	1	2	0	
Somalia	0	1	2	2	1	2	0	0	0	0	0	0	0	
<u>Southern Africa:</u>														
Sao Tome	0	1	0	0	0	0	0	0	0	0	0	0	0	
Gabon	0	1	0	0	0	0	0	0	0	0	0	0	0	
Cabinda	1	0	0	0	0	0	0	0	0	0	0	0	0	
Angola	0	1	0	1	0	1	0	1	1	1	3	1	0	
Southwest Africa	0	1	0	0	0	0	0	0	0	0	0	0	0	
Zaire	3	2	0	1	0	0	0	0	0	0	3	3	1	
Uganda	0	0	0	1	1	1	0	0	1	2	2	3	3	
Kenya	1	5	4	5	3	1	0	1	2	4	3	3	2	
Tanzania	2	9	4	8	8	1	0	1	1	5	3	10	9	
Burandi	0	0	0	0	0	0	0	0	0	0	1	2	0	
Malawai	0	0	0	1	2	0	0	1	1	3	0	0	1	
Zambia	1	0	0	0	0	2	0	0	0	0	0	0	0	
South Africa	1	1	2	1	0	0	0	0	0	0	0	0	0	
Mozambique	1	2	1	1	2	0	0	1	0	1	1	0	0	

the distribution maps can provide some insight. The species is reported from the neotropics, occurring mainly along coastlines on sandy soils, or along the shores of large inland lakes, with the same pattern observed in much of Indonesia, Australia, and the Pacific Islands. In Africa and Southern India, the pattern is different. The species is commonly collected inland on sandy or clay soil, usually in swamps, marshes, or dry lake beds. Plants outside of Eastern Africa are somewhat consistent in their variation, whereas within this large area, there is a great deal of variation with gradients occurring for most of the characteristics. Probably the species was native to the eastern half of Africa (and possibly Southern India?) and then was spread by man to various tropical ports, where the plant became naturalized. Altitudes are rarely given for this species, but specimens have been collected from sea level to occasionally altitudes of 1500 m.

#### KEYS TO VARIETIES AND FORMS:

1. Flowers papilionaceous; stamens diadelphous.
2. Leaflets broad, not elongate to only slightly elongate, ratio of length/width is 1.2-2.5:1; leaflet shape ovate, oval, elliptic, ovate-elliptic, obovate, or sometimes oblong-ovate to oblong-elliptic; leaflet pubescence on upper surface moderate to sparse of very short appressed hairs becoming glabrate, uncinata trichomes lacking or sparse, confined near major nerves; leaflet base cuneate to rotund; flowers large, (3.5) 4-5.5 cm, typically pale blue to purple, occasionally white (pan-tropics) . . . . . 31a. var. ternatea



3. Flowers blue to purple with vexillum yellow to white medially.
  4. Peduncle 0.5-1 (1.5) cm long, rigid; flowers solitary per axil or rarely biflowered at apex of peduncle . . . . . 3laa. f. ternatea
  4. Peduncle 1-4 cm long, base rigid and upper portion lax, slender; flowers several per axil.
    5. Flowers 3-6, racemose near apex of solitary peduncle . . . . . 3lab. f. pauciflora
    5. Flowers 1 or rarely 2 at end of peduncle, 1-4 peduncles per axil . . . . . 3lac. f. fasciculata
3. Flowers white with vexillum greenish to greenish white medially . . . . . 3lad. f. albiflora
2. Leaflets narrow and elongated, ratio of leaflet length/width is (2) 2.6-9.0:1; leaflet shape linear, lanceolate, oblong, lanceolate-oblong, or narrow elliptic (leaflet minute size); leaflet pubescence on upper surface moderately dense to scattered, uncinata, macroscopic trichomes absent; leaflet base rotund; flowers small, (2.5) 3-4 cm, typically white or vexillum white with thin peripheral band of blue (Africa) . . . . . 3lb. var. angustifolia
1. Flowers double, actinomorphic, (4) 5 vexillary-like petals; stamens all free or some filaments free with others connate below in 2-3 fascicles (Common cultivar, can become naturalized) . . . . . 3ld. var. pleniflora
7. Stamens all free.
  8. Flowers blue to purple . . . . . 3lda. f. pleniflora

8. Flowers white . . . . . 3ldb. f. leucopetala
7. Stamens subpolyadelphous, some free with remainder connate  
below in 2-3 bundles of 2-6 stamens . . . . .  
. . . . . 3ldc. f. subpolyadelpa

31a. C. ternatea L. var. ternatea

Leaflets ovate, oval, elliptic, obovate, ovate-elliptic, sometimes oblong-ovate or oblong-elliptic, 1-4 (5) cm wide, apex broadly acute to obtuse, sometimes emarginate, base cuneate to rotund, upper surface pubescence strigose. Flowers blue or occasionally white, papilionaceous, 4-5.5 cm. Legume 6-11 cm long, 8-11 mm wide.

DISTRIBUTION (Figures 65 to 69): This variety is pantropical.

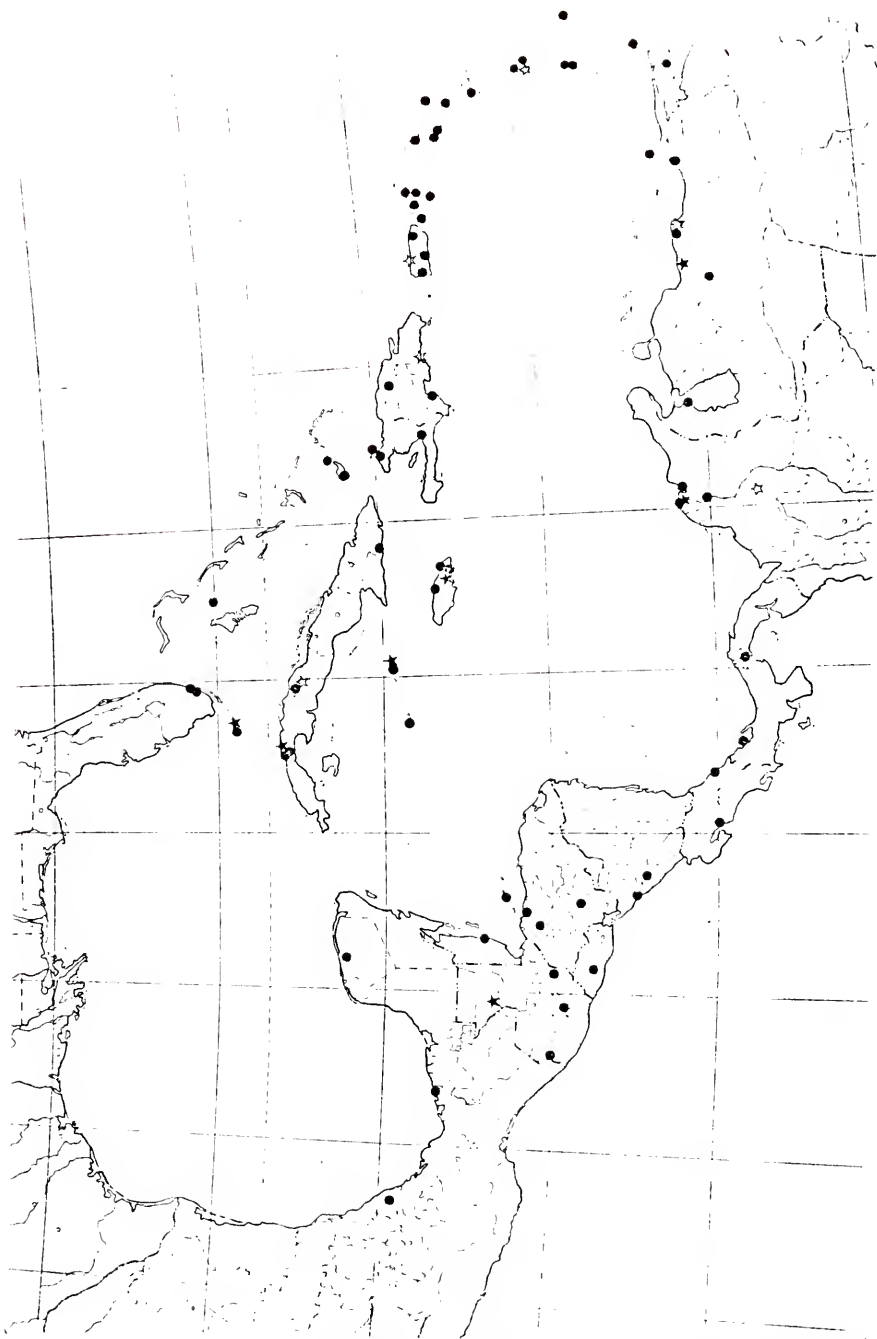
31aa. C. ternatea L. var. ternatea f. ternatea

Flowers blue to purplish, solitary or rarely biflowered, borne at the apex of rigid, short (0.5-1.5 cm), solitary peduncles.

DISTRIBUTION (Figures 65 to 69): This common form is widely known as a cultivar and is naturalized in the pantropics. An extensive number of specimens was examined, thus subheadings are used with the countries arranged in a geographical sequence. Distribution will begin in the neotropics and proceed eastward. Some specimens lack flowers and may belong to f. alba, but are cited with the typical variety, which is more common, and marked with this symbol (\*).

L O C A L I T Y U N K N O W N. Anonymous s.n. (E-82 & 83, HAL 36874, NY, MPU-24, S-5 sh.); 28 Jul 1821, Anonymous s.n. (MPU-16); 10 Jun 1825, -oot. [?] 837 (W-mixed); hb. Delessert, Burmam s.n.

Figure 65. Caribbean American distribution of Clitoria ternatea, subgenus Clitoria. Var. ternatea f. ternatea (●); var. ternatea f. albiflora (★); var. pleniflora f. pleniflora (☆).



(G-2 sh.); hb. Reichenbach f. (W 191795 & 359353); Kat--ng (?), Tierpfloure (?), Anonymous s.n. (W 6834); 1821, Cottah (?) s.n. (E-74); Cuming 616 (CGE); hb. Faculte de Medécine (MPU); cult., hb. Moricand s.n. (G); hortus botanicus, 10/1/1918, Mrysmann (?) 381 (U); Muhlenberg 975 (PH); 29 Aug 10, Ohlweiler MB9 (MO); hort., hb. Rofsi s.n. (PR); Roth s.n. (HAL-mixed); Jard. Bot. de Cho-b-ah (?), 1839, Anonymous 67 (MPU); Fran--bar Joe, unit., Frat., Anonymous 2568 (G); Korealam, 18 Jan 82, Luriakose s.n. (NY); Malines canefields, S. Andrews, Jan 1846, McNab s.n. (E-mixed); Ostindia (?), hb. Rudlof s.n. (\*S); Achimota Gardens, Feb 1930, Irvine 1407 (E); Wullschlagel s.n. (W); spring garden, Wullschlagel 126 (W); Wullschlagel 937 (W), hort. bot., hb. Erlangensis 1773 (M); hb. Moricand, Anonymous s.n. (G-436, no. 1).

# N O R T H   A M E R I C A

U N I T E D   S T A T E S. 1825, Leman I (G). FLORIDA:  
ALACHUA: Gainesville, 1935, Ritchey s.n. (FLAS); l.c., 7 Jun 1935, Ritchey 15532 (FLAS); l.c., Ritchey 117930 (FLAS); l.c., Plant Introduction Garden, 17 Oct 1934, Ritchey s.n. (FLAS). DADE: between Coconut Grove & Cutler, Nov 1904, Small 2225 (NY); Homestead, 5 Nov 1934, McFarlin 9855 (FLAS,NY); Exotic Garden, Miami, 26 Jul 40, Crevasse s.n. (FLAS); Buena Vista, Miami, 18 Dec 1929, Moldenke 5461 (NY). MONROE: Key West Cemetery, Oct 1884, Curtiss s.n. (GH); Key West, 30 Nov-3 Dec 1913, Small & Small 4876 (FLAS,G,GH,MICH,MO,NY, PENN-2 sh.,S,U) and 16 Dec, 4971 (NY,S); Big Pine Key, 30 Jan 1940, Martin 1311 (NY,UC). ST. LUCIE: cult., seed from Costa Rica, Legume Plots, Indian River Field Lab W of Fort Pierce, 8 Nov 1967, Beckner

2184 (FLAS). ILLINOIS: COOK: Chicago Garfield Park Conservatory, 3 Aug 1939, Steyermark s.n. (F). KENTUCKY: FAYETTE: cult., Lexington, Short s.n. (PH). MISSOURI: ST. LOUIS: cult., Shaw School Botany, 23 Sep 1886, B.G. s.n. (MO). TEXAS: Home, 19 Oct 1890, Joor s.n. (MO). ATASCOSA: cult., 4.2 mi NW of Poteet, 9 Oct 1935, Cory 17159 (A). HARRIS: cult. seed from Panama, Houston, 14 Oct 1915, Teas s.n. (MO). TRAVIS: cult. Austin, 6/9/27, Wall 383 (S); cult. and established, Austin, 26 Aug 1943, Pruett 10 (F,W).

M E X I C O. Anonymous s.n. (M 12464); Habanna, Knechtel 729 (W). CAMPECHE: cult., Chan Laguna, 4 Dec 1931, Lundell 1022 (F,GH, MICH,MO,NY). COLIMA: Manzanillo, 20 Oct 1910, Orcutt 4486 (F); vic. of l.c., 28 Nov 1925, Ferris 6043 (GH) & 6051 (GH). JALISCO: Juxpán, Palapar Redondo, 20 m, 6 Nov 1926, Mexia 1070 (UC). NAYARIT: cult., San Blas, Jan 1889, Wright 1344 (F). SINOLA: 1934, Ortega 7319 (F); cliffs, Signal Hill, Mazatlan, 30 ft, 16 Sep 1925, Mexia 34 (UC). TABASCO: Chiltepec, 15 km ENE of Paraíso, 26 Apr 1963, Barlow 12/1 (MICH,WIS). VERA CRUZ: cult., Boquerón carretera Jalapa, 80 m, 31 Jul 1967, Rosas 663 (GH); Ciudad Alemán, 30 m, 18°41' N, 21 Jul 1969, Calderón 1939 (A,MICH,MO); 16.5 km N of Tempoal, 20 Jul 1972, FAO-L 68 (UMO). YUCATAN: Johnston s.n. (F,NY); Izamal, 1888, Gaumer s.n. (F).

B E L I Z E (BR. HONDURAS). Corozal, 1933, Gentle 32 (F) and Jul, 4783 (F,MICH,NY); Little Cocquericot, Belize River, 31 May 1933, Lundell 4412 (F,MICH); Stann Creek, Robertson 121 (BM).

G U A T E M A L A. St. Tomas, Friedrichsthal 144 (W). GUATEMALA: 1942, Aguilar 546 (F). IZABAL: cult., vic. Quirguá, 75-225 m, 15-31 May 1922, Standley 24325 (GH). SAN MARCOS: near Ayutla, 45 m, 14-15 Mar 1939, Standley 68832 (F). ZACAPA: vic.

Zacapa, Dec 1906, Pittier 1738 (BM,NY); l.c., 200 m, 7-16 Oct 1940, Standley 73598 (F); cult. Teculután, 200 m, 6 Oct 1939, Steyermark 29160 (F).

E L S A L V A D O R. vic. San Salvador, 190- , Benson 303 (NY); l.c., 650-850 m, 2-7 Feb 1922, Standley 20595 (GH).

H O N D U R A S. near Roatón on Island of Roatón, 16 Aug 1970, Harmon & Dwyer 3929 (UMO). ATLANTIDA: vic. Tela, 8 Mar 1926, Mitchell 15 (F,GH); cult. Lancetilla Valley, near Tela, 20-600 m, 6 Dec.-20 Mar 1928, Standley 53437 (F). CORTÉS: vic. La Lima, 30 m, 11-20 Apr 1947, Standley & Chacón 7273 (F). VALLE: Amapala, 10 m, 11 Sep 1945, Rodríguez 3335 (F,GH,UC). YORO: Near Progreso, 30 m, 24 Jan 1928, Standley 54974 (F).

N I C A R A G U A. CHINANDEGA: Corinto, 15 Apr 28, Wall 383 (S). MANAGUA: Managua, 18 Dec 1940-9 Feb 1941, Grant 1077 (F).

C O S T A R I C A. Puntarenas, 28 Jul 1882, Lehmann 1734 (BM,G); l.c., Rowlee & Rowlee 63 (NY); cult. Limón, La Zona, 12 Dec 1945, Iruíos (?) 1309 (F).

P A N A M A. Apr. 1852, Andersson s.n. (S); Breyas, 8 Feb 1926, Me11 (NY). BOCAS DEL TORO: Water Valley, vic. Chiriquí Lagoon, 26 Nov 1940, Wedel 1771 (GH,MO); Little Bocas, vic. Chiriquí Lagoon, 12 Jul 1941, Wedel 2511 (GH,MO). CANAL ZONE: along La Cruces Trail, 75 m, 25 Feb 1935, Hunter & Allen 740 (GH,MO); Balboa, 14 Jul 1936, Wall 383 (S). PANAMA: cerca de la Playa de Pta. Paitilla, 12 Aug 1970, Taylor & Correa s.n. (MO).

W E S T I N D I E S

L O C A L I T Y U N K N O W N. Ind. Occ., Anonymous s.n. (S);  
 1.c., Forsstrom s.n. (S); 1.c., Swartz s.n. (S); W. Indies, 1874,  
Kuntze s.n. (F); 1.c., 1885, Eggers 191 (MICH); 1.c., Jan 1817, hb.  
Sarrdey (?) s.n. (W 40138); Ins. Antill., Schomburgk s.n. (HAL).

B A H A M A S. INAGUA: 3 Dec 1890, Hitchcock s.n. (MO). GREAT  
 INAGUA: Mathew Town, 6 Nov 1904, Nash & Taylor 1467 (\*NY); 1.c.,  
 15 Dec 1963, Dunbar 227 (A). NEW PROVIDENCE: Nassau, 29 Jan 1903,  
Curtiss 54 (BM,E,F,G-3 sh.,GH,M,MO,NY,PR); 1.c., 17 Feb 1905, Wight  
110 (F,GH,NY).

C U B A. Anonymous s.n. (PH,U 37643A); Auber s.n. (PH); hb.  
Short s.n. (MO); Read s.n. (\*PH). HAVANA: prope Havana, Sep 1862,  
Schatela s.n. (F); Havana, Jun 1916, Meredith s.n. (PENN,PH); Habana,  
 3 Nov 1864, Schott 114 (F-2 sh.); La Havana, May 1908, Terre s.n. (P);  
 vic. Santiago de las Vegas, 25 Sep 1904, Baker & van Hermann 1926 (F);  
 1.c., cult. at station, 8 May 1905, van Hermann 910 (BM,F,NY); Vedado,  
 12 Apr 1914, Ekman 20 (S); Vento, 3 Jul 1904, Wilson 604 (F). ORIENTE:  
 1856-7, Wright s.n. (GH); Santiago de Cuba near Morro Fortress,  
 3/5/1902, Hamilton 5 (NY); Santiago de la Cuba between Marimon and the  
 town, 17 Oct 1916, Ekman 7950 (S); Sevilla Estate near Santiago, trail  
 Chirigus to Guama R., 13 Sep 1906, Taylor 360 (PH-mixed); vic. San  
 Luis, 15-18 Sep 1902, Pollard & Palmer 301 (F,GH,MO,NY,PH,UC); Cobre,  
 28 Jan 1860, Wright 1592 (G,GH,MO,NY,PH). SANTA CLARA: Laguna de  
 aura, Manigua, 22 Sep 1921, Fernando 632 (GH-mixed); Rd between  
 Soledad & San Antonio, 18 Jul 1936, Smith & Hodgdon 3165 (A,F).



C A Y M A N I S L A N D S. CAYMAN BRAC: East end Spot Bay, 10-30 ft, 24 May 38, Kings 63 (BM,MO). GRAND CAYMAN: Jan 1821, Hitchcock s.n. (MO); Bodden Bay Rd, 13 Feb 1899, Millspaugh 1318 (F-2 sh.); center of island, 14 Feb 1899, Millspaugh 1383 (F,PH); Georgetown, 26 Apr 38, Lewis 43 (BM,MO); l.c., Crewe Rd, 29 Jul 1965, Brunt 1727 (BM); cliff off Jackson Point SE of Georgetown, 15-20 ft, 23 Apr 38, Kings 186 (BM,MO) and 227 (BM,MO); Newlands Barcadere Rd, 16 Jul 1965, Brunt 1645 (BM); along track between Old Isaacs & Winterland, 22 Apr 1956, Proctor 15182 (BM).

J A M A I C A. Apr 1818, Caley s.n. (BM); Smith s.n. (PH); Swartz s.n. (S-2 sh.); Albion, 14 Apr 1927, Orcutt 1391 (UC); E of Airport Sta. 4, Palisadoes, 25 ft, 4 Jul 1952, West & Arnold 432 (FLAS). PORTLAND: Port Antonio near shore, 16 Jan 1906, Wight 63 (F,NY). ST. ANDREW: Univ. of West Indies campus, 600 ft, 27 Jun 1963, Crosby, Hespenheide, & Anderson 346 (F,GH,MICH,MO,NY,UC); Kingston Streets, 12-9-90, Hitchcock s.n. (MO-2 sh., mixed); RR tracks near Kingston, Feb-Mar 1916, Killip 74 (W); 7 mi E of Kingston, Seven-Mile Beach, 29 Jun 1958, Sauer 1904 (WIS); between Kingston & Gregory Park along RR, sea level, 22 Feb 1920, Maxon & Killip 301 (F,GH,NY). ST. ANN: Llandovery to Runaway Bay, 29 Mar 1908, Harris 10370 (BM,F,NY); W end of Cardiff Hall Beach, Runaway Bay, 21 Jul 1961, Powell 969 (MICH,U). ST. MARYS: Gray's Inn, Dec 1927, Orcutt 4294 (UC); Mouth of Rio Nuevo, ca 10 km E of Ocho Rios, sea level, 27 Jun 1958, Sauer 1876 (WIS). ST. THOMAS: mile 13.5 on Windward Rd, 300 ft, 21 Nov 1959, Adams 5489 (M); Yallahs, 30 m, 16 Jun 1952, Araque-Molina & Barkley 22J449 (MICH).

H A I T I. Massif de la Pelle, Port-au-Prince, Fort Bolosse, 50 m, 2 Oct 1927, Ekman 9102 (S); Pont Bludet, 11 Aug 39, Pride s.n. (WIS); Damiln, 13 Jul 39, Pride s.n. (WIS); near Artibenite River 2 mi W of Petite River, Mar 1925, Sweet s.n. (NY); vic. Gras Morue Road, Port de Paix, 9 Jan 1929, Leonard & Leonard 11786 (GH,UC-mixed); cult., Jeremie, 5 Mar 1942, Seibert 1800 (MO). ILE DE LA TORTUE: slopes above Basse Terre, 21-29 Mar 1929, Leonard & Leonard 13983 (MICH,NY); Haut de Paluriste Rd, vic of La Vallée, 28 Dec 1928-9 Jan 1929, Leonard & Leonard 11591 (MO).

D O M I N I C A N R E P U B L I C. Johnston s.n. (E); Najayo, Hispaniola, Dec 1962, Angusto 449 (NY). BARAHONA: Am Duvergé Fluss, 75 m, Aug 1910, Fuertes 375 (E,G-4 sh.,GH,NY,U); prope Barahona, 26 Nov 1910, Fuertes 375 (W). SANTIAGO: Quinigua near Santiago, 29 Oct 1946, Howard & Howard 9695 (GH,MICH,MY,S); Hato del Yaque, 10 km on road to Los Matos, 200 m, 23 Mar 1969, Liogier 14534 (NY).

P U E R T O R I C O. Rd to El Conquistador Hotel, 22 Apr 1963, Wagner 222 (U); Joanna-dior pres de Jerrano, 23 Feb 1865, hb. Tuczkievicz s.n. (MPU); Montalva, 2-4 Mar 1915, Britton, Cowell, & Brown 4875 (NY). BAYAMON: Santurce, 2 Jan 1938, Otero 456 (A,F,MO). FAJARDO: ad Fajardo versus mare, 20 May 1885, Sinten 1639 (G-2 sh., GH,M-2 sh.,S). GUANICA: 22 Jan 1899, Millspaugh 728 (F,NY); Santa Rica, 8 Sep 1914, Stevenson 2244 (F). GUAYAMA: 16 Mar 1874, hb. Kuntze (NY). MAYAGÜEZ: ad Mayagüez versus Guanajilo, 4 Jan 1885, Sinten 825 (M,PH). PONCE: RR 2 mi W of Ponce, 6 Dec 1902, Heller 6224 (E,F,G,GH,MO,NY,PH). RIO PIEDRAS: Fuica, Buen Consejo, May 1914, Hioram (F,NY). SALINAS: Paso Seco, 28 Feb 1932, Britton &

Britton 9933 (NY). VIEQUES: Isabel Sequenda to Campo Cielo, 24 Jan 1914, Shafer 2358 (NY).

V I R G I N I S L A N D S. ST. CROIX: Browne s.n. (\*PH-frag.); Feb 1955, Hunnewell 20115 (GH); Read s.n. (PH); Dec 1895, Ricksecker 152 (F-2 sh.,GH,MO,NY,UC); Bassin, Jan 1897, Ricksecker 7 (E,F,MO); Grauge, 1800, Hausen s.n. (S); Frederiksted, 1 Feb 1913, Rose, Fitch, & Russell 3216 (NY); River Gut, 10 Feb 1924, Thompson 688 (GH); Armas Hope, 27 Apr 1925, Thompson 826 (PH) and 8 Oct, 859 (S-2 sh.). ST THOMAS: Blauner 60 (G); hb. Endl. s.n. (W); Nov 1880, Eggers (NY); 1885, Eggers s.n. (NY); Jan 1887, Eggers s.n. (F); Jan 1887, Eggers 87 (GH); Nov 1880, Eggers 123 (GH); ad Sugar Estate, Jan 1887, Eggers 52 (M-2 sh.,MICH-mixed,S); Nisky (or Nistry), Dec 1880, Eggers 221 (G-2 sh.,M-2 sh.,MPU,UC,W); Ehrenberg s.n. (HAL); Ehrenberg Jr. 150 (HAL); Gutthnick 60 (BM); Westindien, Harinarson s.n. (S); Placide Duchaisamy, Holton s.n. (NY); 28 Feb 14, Kuntze 200 (NY-mixed); Charlotte Amalie, 17-18 Jan, Millspaugh 373 (F) and 397 (F) and 409 (F) and 411 (F); 17 Nov 1905, Raunkaier s.n. (U); Schomburgk s.n. (NY); pr. Mt. Joubert, Apr 1827, Wydler 79 (G). TORTOLA: St. Bernard, Jun 1832, hb. Lindley, Anonymous 587 (CGE); Lower Estates, 10 m, 8 Nov 1965, D'Arcy 299 (A) and 15 Feb 1966, 722b (A) and 722C (FLAS); Fish Bay to Road Tower, 13-17 Feb 1913, Britton & Schafer 920 (NY); Copses Experiment Station, 3 Oct 1918, Fishlock 195 (GH,PH). VIRGIN GORDA: 13 Nov 1918, Fishlock 50 (NY).

L E E W A R D I S L A N D S. ANTIGUA: 20 Apr 1913, Wheeler 23 (BM); 1849, Wullschlaegel 126 (M); Gunthorpes, 8 Sep 1937, Box 1044 (BM,F,MICH); near St. Johns, 16-17 Jan 1907, Shafer 11 (NY). BARBUDA: Codrington Village, 14 Mar 1932, Fairchild 3824 (\*UC). GUADELOUPE:

1839, Beaupertuis s.n. (A); Duchassning s.n. (NY,W-3 sh.); 10-4-1892, Duss 3232 (NY); Read s.n. (PH); près du Prestoytère, Jan 1933, Quentin 626 (A). MONTSERRAT: Windward Rd near Bethal, 9 Feb 1907, Shafer 503 (F,NY). ST. BARTHELEMY: Forrstrom s.n. (S-3 sh.); Von Goës s.n. (S). ST. EUSTATIUS: Van Goës s.n. (U). ST. KITTS: Cauada Estate, 8 Sep-5 Oct 1901, Britton & Cowell 232 (NY). ST. MARTIN: Bergbrant, 50 m, 2 Feb 1958, Hummel s.n. (S).

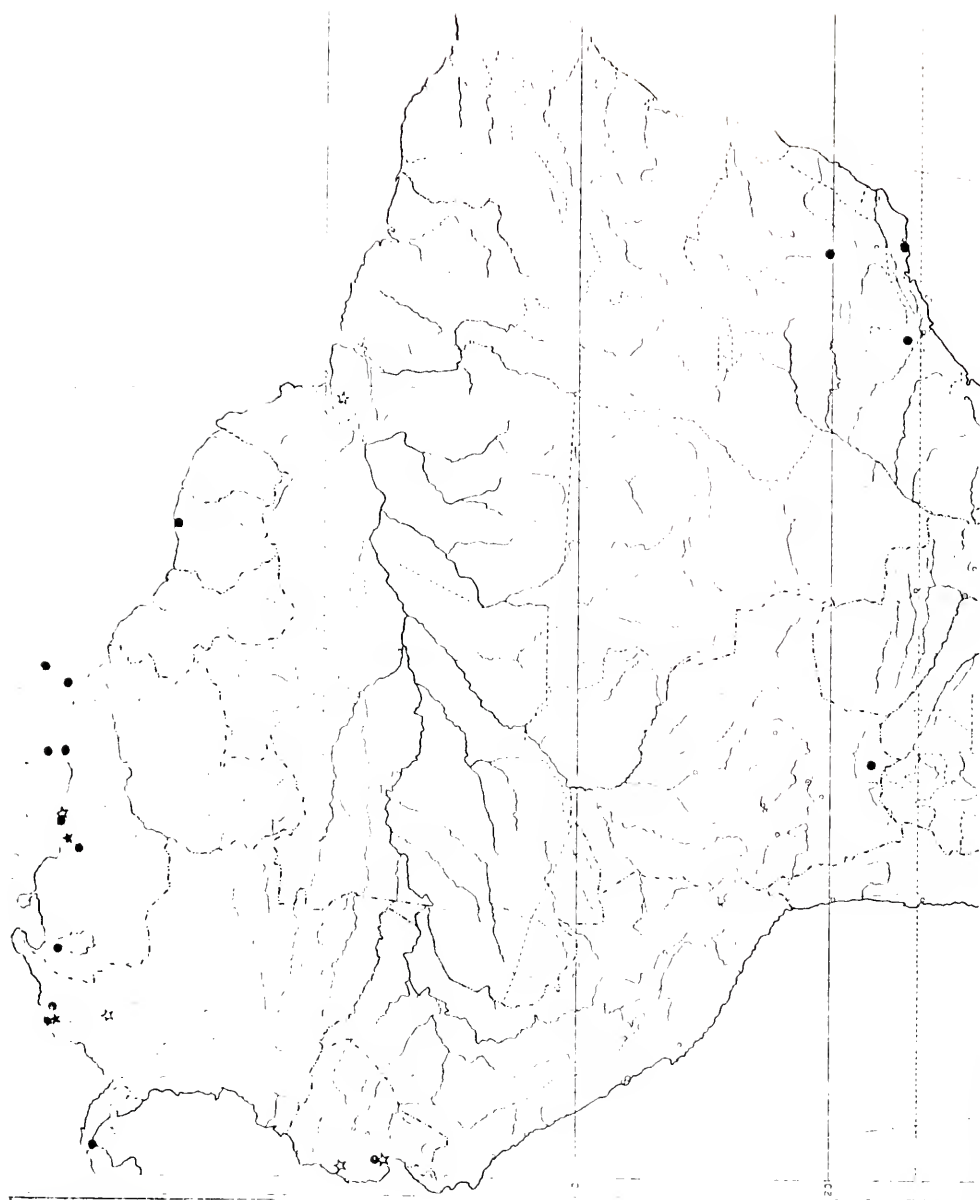
W I N D W A R D I S L A N D S. BARBADOS: Dodds, St. Phillip, Anonymous s.n. (F,NY); St. George, Apr 1940, Goodwis 106 (BM); Speightstown, 23 Oct 1950, Florschütz & Florschütz 67 (U). BEQUIA: 500 ft, Jun, Joseph B253 (BM). MARTINIQUE: Brongniart 17 (S); Fleé 677 (A); Sieber 238 (W); 30 m, 11 Jan 1939, Stehlé & Stehlé 3484 (NY); La Vauchin, 5 m, 15 Feb 1939, Stehlé & Stehlé 3520 (NY-mixed); St. Anne, 3 Jul 1939, Egler 39-48 (NY); Case-Pilote, Feb 1868, Hahn 234 (BM-mixed,G-6 sh.,M,P,NY,W); Schoelcher 9 May 1934, Rodriquez 3699 (P). ST. VINCENTS: Smith & Smith 823 (GH,NY).

T R I N I D A D A N D T O B A G O. TOBAGO: Nov 1889, Eggers 5915 (NY); Mockley Vale, Apr 1910, Broadway 3570 (F-mixed). TRINIDAD: Usine St. Madeleine, San Fernando, 17 Mar 1925, Broadway 5627 (F,MO,S,U,UC).

A R U B A. Cult. Savoneta, 26 Jan 1953, Stoffers 1900 (U).

C U R A C A O. Realino s.n. (NY); Beehenburg, 14 Oct 1907, Anonymous 806 (U); Ronde Klip, 28 Dec 1951, Arnoldo 1809 (U); Santa Cruz, 20-27 Mar 1913, Britton & Shafer 3009 (NY,U); Gr. Piscadera, Hofje van der Mark, 10 Jan 1949, Burgers 100 (U); Hofje near Weis Afo., 22 Feb 1969, Nagelkerken 115 (A,U); Klein Sta Martha, 27 Sep

Figure 66. South American distribution of Clitoria ternatea, subgenus Clitoria. Var. ternatea f. ternatea (●); var. ternatea f. albiflora (★); var. pleniflora f. pleniflora (☆).



1952, Stoffers 84 (U) and 109 (U); Cas Cora, 7 Oct 1952, Stoffers 258 (U); Aschenberg s.n. (U).

# S O U T H A M E R I C A

E C U A D O R. 1964, Delgado 17 (MO). GUAYAS: Guayaquil, 1852, Andersson 183 (S); cult. l.c., Jul 1927, Mille s.n. (F).

C O L O M B I A. Cacaqualito, 1500 ft, 15 Nov 1898, Smith 291 (BM,E,F,G-3 sh.,GH-mixed,MICH,MO,MPU,NY,PENN,PH,S-2 sh.,U,UC,WIS); vic. Bananquilla, Jul 1927, Elias 233 (U); Cundinamarca, Tocaima, carretera de Tocaima a Pubenza, 350-400 m, 14 Apr 1952, García-Barriga 14186 (NY); cult. Tocaima, 435 m, 20 Feb 1876, Andre 1824 (NY). Cali, valle del Cauca, 1000 m, Jaramillo 1027 (F). CALDAS: Chinchiná, 1350-1400 m, 22 Nov 1946, Cuatrecasas 23077 (F). MAGDALENA: Cienaga, 6-13 Sep 1898, Smith 291 (NY).

V E N E Z U E L A. COJEDES: cult. M.A.C. Station, San Carlos, 9 May 1944, Rudd 513 (VEN). MARGARITA ISLE: El Valle, 17 Jul 1901, Miller & Johnston 55 (BM,F,GH,MO-2 sh.,NY); l.c., 15 Jul 1903, Johnston 36 (GH). MIRANDA: Coastal Rd between Airport & Las Caracas, 5 Jun 1967, Robertson & Austin 114 (MO). SUCRE: Cumaná, 50 m, 29 Dec 1953, Dominguez s.n. (VEN). ZULIA: Maracaibo, 1893-94, Mocquerys 809 (\*NY,S); Granja Facultad de Agronomía L.U.Z., Maracaibo, 3 May 1974, Zambrano 105 (FLAS,LA).

S U R I N A M. 1841, Berthoud-Coulon 11.112 (BM) and 11.115 (BM); Hostman 43a (S,U) and 416 (BM,CGE,NY,W-2 sh.) and Mar 1842, 417 (G); Jun 1838, Splitgerber s.n. (W). SARAMACCA: Militair Hospital, Paramaibo, Oct 1901, Went 489 (U).

F R E N C H   G U Y A N A. cult. Karouany, Jun 1855, Sagot s.n. (BM,S); Konakry [?], Feb 1910, Boué 29 (G).

B R A Z I L. Anonymous s.n. (MPU-18); Exped. Novara, Anonymous s.n. (W); Blanchet s.n. (BM) and 39 (F); Montiba, Blanchet s.n. (W); 1841, Martius 1118 (BM,G-2 sh.,HAL,M,NY,S); Widgren 1333 (S). BAHIA: Blanchet 5 (G-2 sh.); hb. Salzmann (MPU); 1830, Salzmann 144 (G). GUANABARA: cult. Jard. Bot. do Rio de Janeiro, Anonymous s.n. (RB 11853); prope Rio de Janeiro, Daellinger s.n. (M); cult. Rio de Janeiro, Donville s.n. (G); l.c., Tweedie 1276 (U). MINAS GERAIS: cult. mun. Belo Horizonte, 27 Apr 1935, Barreto 5707 (F). PERNANBUCO: cult. Tapera, Oct 1930, Pickel 112 (F) and Dec 1930, 112 (BM); l.c., Aug 1931, Pickel s.n. (F,GH,MICH,NY,PH); Pesqueira, Fazenda Peixe, 22 Feb 1962, Santos 1105, Fromm 1073, & Sacco s.n. (M). SÃO PAULO: Fazenda Santa Elisa, Campinas, 15 May 1942, Santoro 6754 (UC).

B O L I V I A. TARIJA: Caingua, 15 km N de Villa Montes, 3 Jun 1971, Krapovickas, Mroginski, & Fernandez 19448 (WIS).

P A R A G U A Y. cult. Jardin Botánico Asunción, 25-26°S - 56-58°W, 20 Sep 1945, Teague 117 (BM).

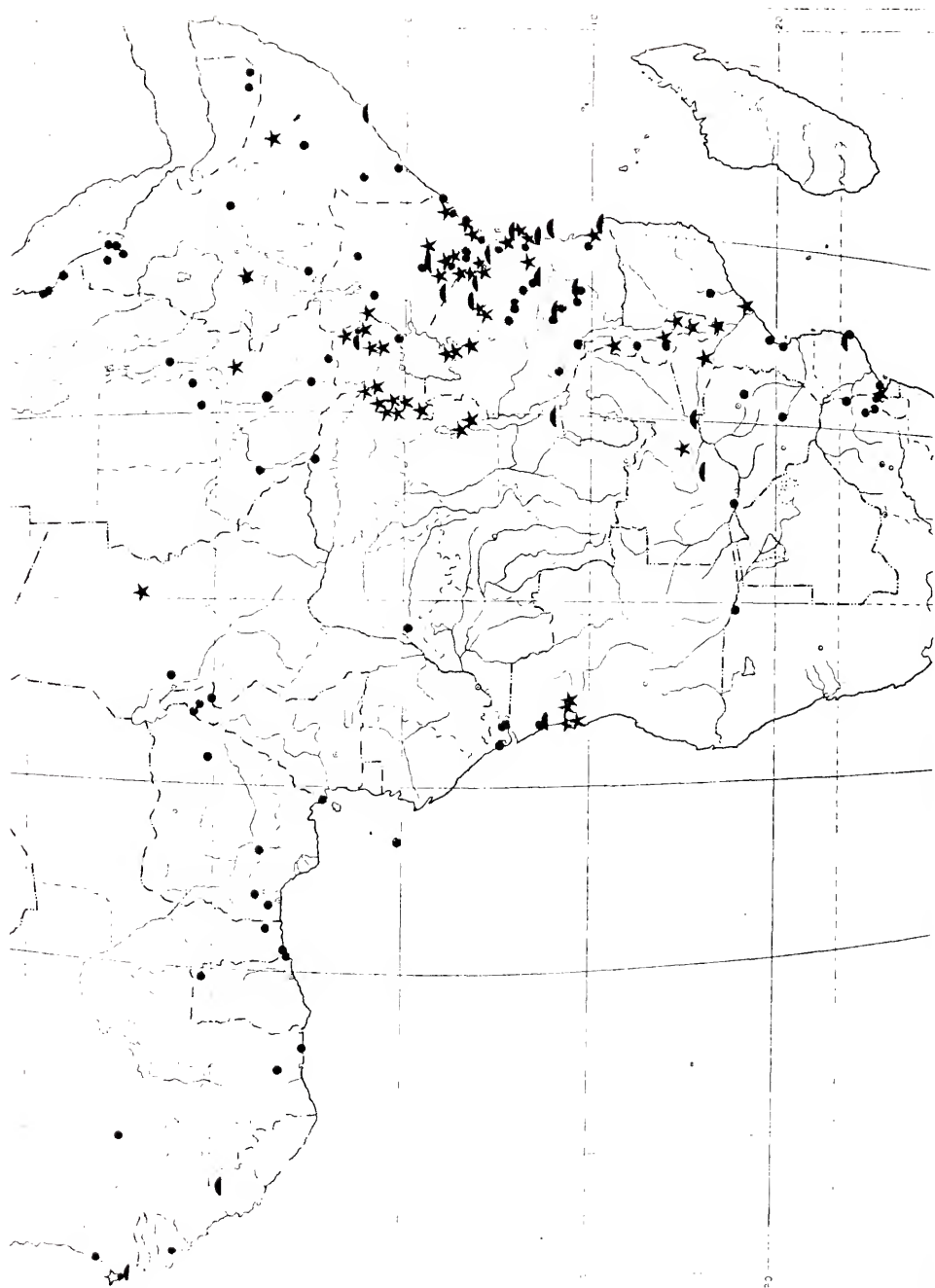
U R U G U A Y: This author has not examined any specimens of C. ternatea from Uruguay. Herter (1954, fas. 14, p. 453, no. 1729) included an illustration of the species in his "Flora Ilustrada del Uruguay," which is C. ternatea var. ternatea. The specimen used for the illustration was probably a cultivar.

#### E U R O P E

F E D E R A L   R E P U B L I C   O F   G E R M A N Y. cult. Univ. Bot. Gard., Muchen, 1958, Anonymous s.n. (M,NY); hort. Bot.



Figure 67. African distribution of Clitoria ternatea, subgenus Clitoria. Var. ternatea f. ternatea (●); var. ternatea f. albiflora (◐); var. ternatea f. pauciflora (☆); var. angustifolia (★).



Monacensis, 18.., Anonymous s.n. (M); hort. ad Moers, hb. Grimm, 1806, Salzwedel s.n. (M).

# N O R T H E R N   A F R I C A

C A P E   V E R D E   I S L A N D S. 1895, Cardoso 146 (\*K).

S E N E G A L. Sparman s.n. (S-4 sh.); St. Louis, 1837, Heudelot 538 (G); Dakar, 22 Apr 1829, Perrotet 223 (BM,W).

G A M B I A. Kuntaur, 1948, Ruxton 20 (K).

P O R T U G U E S E   G U I N E A. Arredores de Bissau, 4 Jan 1963, Guerra 3980 (K).

M A L I (FRENCH SUDAN). Nioro, 15 Oct 1954, Davey 106 (K).

S I E R R A   L E O N E. 1854, Daniels s.n. (BM); Rakupr Station, Jul 1950, Macluskie 16 (E).

I V O R Y   C O A S T. Adiopodume, 26 Sep 50, Roberty 12217 (G); Oumé, 5 Mar 51, Roberty 14099 (G,MO); Abidjan, 8 Dec 54, Roberty 15794 (G-2 sh.); de Turois, Abidjan, 29 Dec 64, Toilliez 234 (\*G).

G H A N A (GOLD COAST). Received from W Africa Cacao Research Institute in 1947-48, Anonymous 67 (E); Kwadaso Agric. Station, 29 Apr 1963, Obeng-Darko 5050 (K). GOLD COAST: S. Gold Coast, 11 Jun 1924, Cheeseman s.n. (BM); Keta Jelokofe Road, 15 Nov 1957, Enti 609 (K). NORTHERN: Gambaga, Mamprise Dist., 22 Mar 1958, Hepper & Morton A3135 (K).

T O G O: Derrière Lomé, rive de la lagune asséchée, 15 Jun 1931, Duffour 6607 (G-3 sh.,MPU).

D A H O M E Y: Cercle de Zagnanado, pays de Hollis, entre Abbo & Massi, 6/2.1910, Chevalier 22990 (K).

N I G E R I A. NORTHERN: 20 mi S of Gombe, 10 Oct 1921, Lely 664 (K); Nupe, 1906-07, Yates s.n. (BM); River Benue, Sep 1910, Talbot s.n. (BM,MO); within 50 mi of Maifoni, Bornu, 6 Jul 1909, Parsons s.n. (K). WESTERN: Abbeokute, 1859, Barter 3394 (K); Forest Hill, near Forest Hgrs. Office Compound, Oyo, 20 Apr 45, Onochie 7750 (BM); Lokofa Dist., Parsons s.n. (K).

C A M E R O U N. CAMEROON: cult. Victoria Bot. Gardens, 22 Jan 60, Ogu 98 (E); N. Cameroons, Oct 1910, Talbot s.n. (BM). MAROUA: près Doumrou, 8 km SSE de Kaele, 31 Aug 1964, Letouzey 6579 (K); collines de Mogazang, 10 km N de Maroua, 23 Sep 1964, Letouzey 7038 (K); 20 mi von Morà, Aug 54, Vogel 42 (BM).

C H A D. Baguirmi & région du lac Fittri, Ardebé, 31 Aug 1903, Chevalier 9662 (K).

A N G L O - E G Y P T I A N S U D A N. Nubia, 1839, Paul s.n. (M) and 280 (\*M). AL ISTIWA'IYAH: cult. Juba, Bahr el Gebel, 11 Jul 1929, Simpson 7354 (BM); Logire, Torit Dist., 33°1'E-4°1'N, 950 m, 6 Jun 49, Jackson 800 (BM). AN NIL AL AZRAQ: Tozi, Blue Nile prov., 2-10-1952, Lea 12 (K); Jebeleire, White Nile, 1909, Broun 910 (BM). AS SUDD A'ALI AN NIL: Jongols Post, 33°20'E-10°8'N, 21 Sep 1951, Sherif A4012 (K). BAHR AL GHAZAL: Wau, 13 Feb 1937, Myers 6297 (K). DARFUR: Darfour, Purdy 34 (K). KASSALA: S of Tokar Delta, Aqiq, 50 ft, 12 Apr 49, Bally B7009 (G,K); Has Tauranil, Red Sea, Feb 69, Lord s.n. (K); Diokirhten, Nubische Küste, 1865, Schweinfurth 1752 (BM); maritan plain between Port Sudan and Suakin, Red Sea, 29 Nov 1927, Newberry 366 (BM); flats near Port Sudan, Red Sea, 25 Jan 1912, MacDoregal & Sykes 19 (BM). KORDOFAN: Nuba Mts., 1500 ft, 23 Nov 1921, Lugard 22 (BM); Abou Gureis, Nurschagga, Kordofan, Aug 1875,

Pfund 141 (F); ad pagum Cordofanum Milbes, inter Nubicum, 4 Dec 1839, Kotschy 287 (BM,E,G-3 sh.,GH,K,M-2 sh.,MO-mixed,MPU,NY-2 sh.,S,W. non: HAL,MO).

E T H I O P I A (ABYSSINIA). Abyssinia, Salt s.n. (BM); l.c., Sep 1853, Schimper 387 (K,MPU); l.c., Schimper & Kotschy 6635 (E); in valle Aguar, 8 Apr 1839, Schimper 1009 (BM-2 sh.,G-2 sh.,HAL,K,M,NY-2 sh.,S,W); Donver et Rar el Fil, Wurtenburg s.n. (W-mixed). ERITRIA: Massawa, 17 Jan 1963, Hagos 144 (K); Massaua, Lamphar, Dec 1872, Hildebrandt 728 (BM,PH,W-2 sh.); Massaua pres qu'ile d Abd el Rader, 10 Feb 1892, Schweinfurth & Riva 207 (G); Ghinda, hauteur de Donkollo, 950 m, 14 May 1892, Schweinfurth & Riva 2135 (G,K); Ghinda-Baresa, 1000 m, 17 Feb 1893, Terracciano & Pappi 37 (G); Amasen, Lungo il terrente Fil-Fil, 23 May 1902, Pappi 5440 (BM-mixed; probably belonged to 5441 collection) and 5441 (BM); Keren, Boyas, 15 Aug 1861, Heudner 41 (K,S). GAMU-GOFA: Woito River, ca 5 mi from junction with Sagan, 12 Aug 1969, Gilbert & Gilbert 1553 (K). HARAR: Hardegger s.n. (W); Kallafo, 23 Aug 1960, Anonymous, IECAMA no. I-81 (K). SHOA: Ghibbie Valley, 37°35'E-8°15'N, 1225 m, 10 Apr 1961, Brehme in Mooney hb. 9063 (K).

S O M A L I A. lungo d'Daua, horti Romoni, 24 Apr 1893, Riva 1081 (G); vallata del Neb Rusfidi, 19 Feb 1890, Riva 924 (G). LOWER GIUBA: Basso Giuba a Gelib, Mobilen, Feb 1940, Agrario 23 (W). NORTHEAST: Las Anod, 7-2-1942, Peck Y124 (K); between Bihen & Las Anod, 27 Oct 44, Glover & Gilliland 140 (BM,K). UPPER GIUBA: immediate vicinity of Juba River, Bardera, 500 ft, 30 Sep 1953, Balley B9042 (K,UC).

S O U T H E R N   A F R I C A

S Ã O   T O M É. cult. Cidade, 24 Feb 1949, Santo 212 (BM).

G A B O N. 5 Nov 1909, Thollon 131 (K).

C A B I N D A. Cabinda, 1915, T.T. 6442 (BM).

A N G O L A. LUANDA: Ambriz, cult. from seed sent from Gaboon, May 1873, Monteiro & Monteiro s.n. (K).

S O U T H W E S T   A F R I C A (NAMBIA). Runtu, garden escape, Okavango native territory, 1-12-55, Winter 3773 (K,M).

Z A I R E (BELGIUM CONGO). EQUATEUR: Eala, Coquilhatville terr., Nov 1923, Goossens 4469 (K). LÉOPOLDVILLE: Bas Congo, 1921, Claessens s.n. (M); I.N.E.A.C. Luki, Bas Congo, Lukula terr., 1959, Flamigni 10731 (UC); Boma, 4 Jul 1895, DeWe'vre 94 (K). ORIENTAL: Brousse Sta., Doruma, Oct 1936, Graer 674 (BM,K).

U G A N D A. EASTERN: Mjanji, Samia Bugwe, 3800 ft, 10 Nov 52, Harker 12 (K). NORTHERN: Kangole, Karanoja terr., 4000 ft, 22 May 40, Thomas 3446 (K).

K E N Y A. Kiangamini Island 55 mi NE of Lamu, 5 ft, 26 Jul 61, Gillespie 54 (K); Tana River, 1600 ft, 5 Apr 1910, Battiscombe 267 (K); Malindi, 28 Jul 58, Hacker C15 (K); Kibarani, 21 Apr 45, Jeffery K2 (K); Mombassa, 1909, Horn s.n. (W); Jilore, Giriyana, Mombassa, 23 Nov 1923, Gore 22 (BM); Shimba Hills, Kwale dist., 450 ft, 10-5-1968, Magogo & Glover 1037 (K); Voi, 2000-3000 ft, May 1931, Napier 958 (K); Teita Hills, 2000 ft, 20 Mar 1906, Grenfeld s.n. (K); Tsavo Nat. Park, Apr 1965, Hucks 325 (K). CENTRAL: Embene, near Embu, 3600 ft, Graham 1736 (K). NORTHERN: Marsabit, 4000 ft, May 1959, Adamson 5 (K); ca 12 mi NNE of Kangetet, 1900 ft, 25 May 1970, Mathew 6389 (K); Lake

Rudolf, 14 Sep 1899, Wellby s.n. (K); Della, N.F.D., 23 Jun 1951, Kirrika 74 (K). SOUTHERN: Kibwesi, Ukambani, 1000 m, 4 Dec 1905, Scheffler 36 (BM,E-2 sh.,G,K,PR,S,W).

T A N Z A N I A (TANGANYIKA). CENTRAL: plains between Babati & Dodona, 1 Mar 38, Martunes 114 (BM); Ikowa Dam, c 60 km E of Dodona, 900 m, 29 Jul 1970, Thulin & Mharo 540 (\*K); road from Chunya to Itigi, Itigi dist., 1500 m, 26 Jan 1968, Richards 22959 (K); Mpwapwa, 31 Dec 1946, Rensberg & Musomi 582 (K). EASTERN: Bagamoyo, sea level, 9 Dec 1952, Curle 446 (BM); Kilosa, 8 Mar 1926, Burt 131 (BM); östlicher Mahenge Bezirk zwischen Mahenge-Plateau und Zusammenfluss von Kilombero (Ulanga) Luwegu zum Rufiji, 400 m, 8 Jun 1932, Schlieben 2287 (BM,G; non K,M,S). SOUTHERN: 160 km W Lindi, Bezirk Lindi, 450 m, 22 Apr 1935, Schlieben 6358 (BM,G,M,S). SOUTHERN HIGHLANDS: Mwayembe Swamp, Iringa Dist., 2700 ft, 28 Oct 1970, Richards & Arasululu 26337 (K); Ruaha Nat. Park, 9 km NE of Msembe, 790 m, 26 Jan 1972, Bjørnstad 1271 (K); Ruaha N. Park, track to Msonya, 840 m, 12 Jan 1966, Richards 20978 (K,NY,S): near Igawa, Mbeya Dist., 1350 m, 18 Jan 1957, Richards 7882 (K); Igawa-Mberga road, 1800 m, 4 Mar 1961, Richards 14228 (K). TANGA: Maganga, 25 Jan 1967, Rykebasch M371 (K); Gereza East, Mnyusi, Korogwe Dist., Sep 1954, Semsei 1797 (K). WESTERN: East Rukwa, 3000 ft, Apr 1938, Martunes 263 (BM). ZANZIBAR: in Garden gezogen, Nov 1873, Hildebrandt 1188 (BM,K,W-2 sh.).

Z A M B I A (NORTHERN RHODESIA). SOUTHERN: Victoria Falls Station, Livingston Dist., 30 Mar 1956, Gilger 610. CENTRAL: Feira, 15 Dec 1970, Fanshawe 11025 (K).

R H O D E S I A (SOUTHERN RHODESIA). Sabi Valley Experiment Station, Chipinga Dist., Feb 1960, Soane 263 (K); cult., Marandellas Dist., 19 Mar 1961, Crosby 968 (K).

S O U T H A F R I C A. TRANSVAAL: 24 mi ESE of Skukuza, Nelspruit Dist., 1600 ft, 17 Jan 1953, Acocks 16735 (K); Grasskop, 28 Nov 1917, Pole-Evans 16915 (K); Kruger Nat. Park, Numbi gate, 2000 ft, 14 Nov 1951, Schijff 124 (K); Kruger Nat. Park, 17 Jan 1953, Schijff 1765 (K); Komati Poort, 1000 ft, 18 Dec 1897, Schlechter 11825 (BM,E,G-5 sh.,K,PR-2 sh.).

M O Z A M B I Q U E (PORTUGUESE EAST AFRICA). LOURENCO MARQUES: Lourenco Marques encosta da Ponta Vermelha, 18 Jan 1960, Lemos & Balsinhas 4 (BM,K-2 sh.). SOFALA: Sofala, sea level, 24 Sep 1961, Methuen 244 (K). SUL DO SAVE: Villa Inhambane, Dec 1936, Sousa 1943 (K,MO); Limpopo Valley, Sousa 701 (K). ZAMBEZIA: Mocuba, posto Agricola, 16 May 1949, Barbosa & Carvalho 2645 (K).

M A L A W I (NYASALAND). CENTRAL: Dist. Lilongwe, 18 Aug 1964, Salubeni 339 (BM,MO). NORTHERN: Rhumpi, Dec 1952, Craske 1 (BM); Rhumpi Dist., St. Patrick's Parish, 3000 ft, 9 Feb 1969, Pawek 1702 (K).

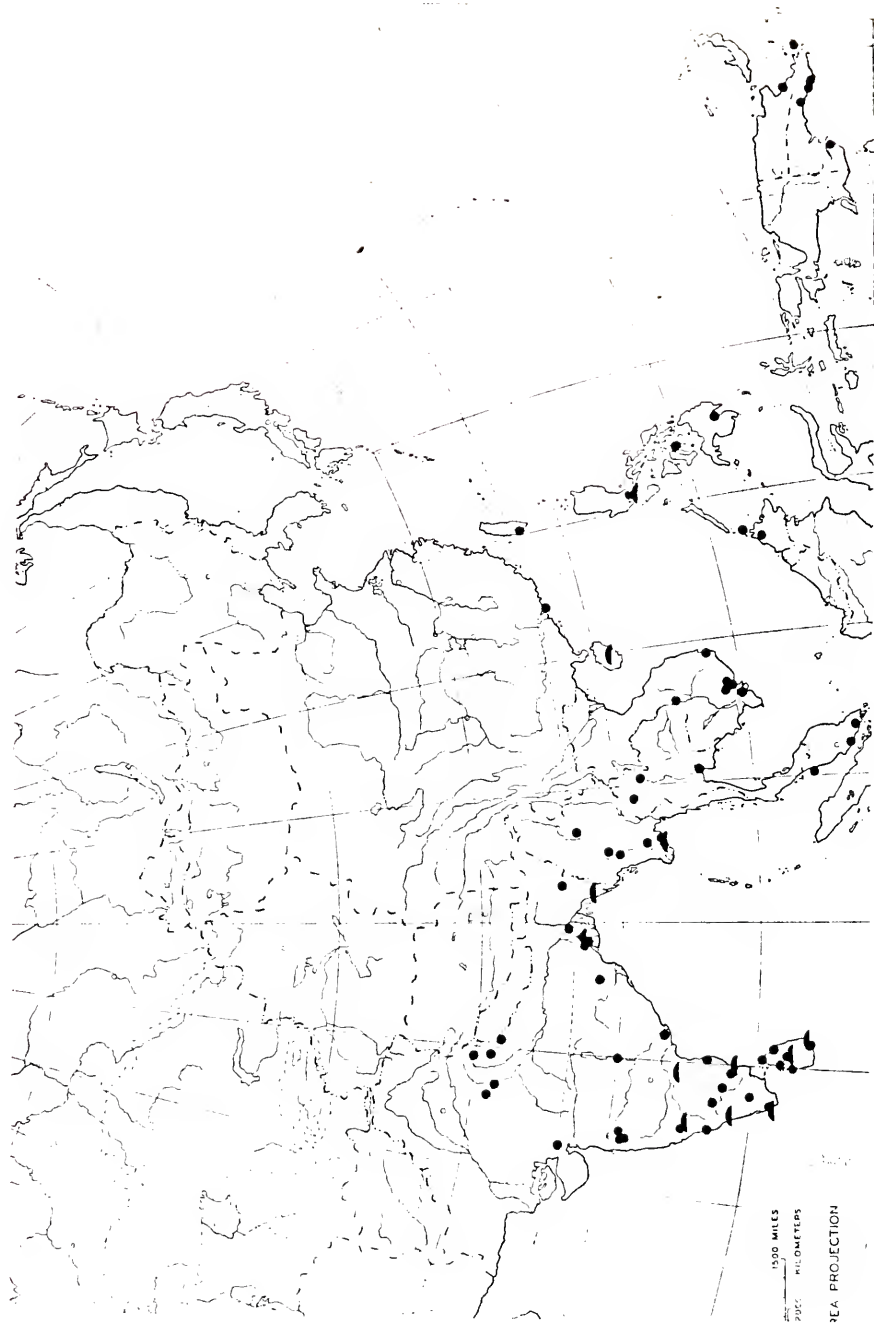
#### W E S T E R N I N D I A N O C E A N

A L D A B R A I S L A N D S. WEST ISLAND: 200 m S of manager's house, 10 Jan 1972, Wood 1634 (K).

S E Y C H E L L E S I S L A N D S. 1841, Pervillé 124 (K). MAHE ISLAND: Port Victoria, 1867, Neville s.n. (K); Northwest Bay, 1 May 1963, Sauer 3678 (WIS).



Figure 68. Asian distribution of Clitoria ternatea, subgenus Clitoria. Var. ternatea f. ternatea (●); var. ternatea f. albiflora (◐); var. ternatea f. fasciculata (▲).



M A S C A R E N E I S L A N D S. MAURITIUS (ISLE DE FRANCE):  
 hb. Cambessedes s.n. (MPU); Commerson s.n. (RB; \*G); cult., Bouton s.n. (CGE); 1864, Bouton s.n. (K); Sieber 189 (HAL,M,PR,W); 1826, Sieber 238 (G-2 sh. & mixed,HAL,W); Hilsenberg 1352 (PR). REUNION (ILE DE BOURBON): 1846-52, hb. Delessert, Voyage Boivin 1463 (G); Commerson s.n. (G); 1833, Goudot s.n. (G-mixed); 1826, Perrottet s.n. (G).

R O D R I G U E Z I S L A N D. Rodrigues, Venus Expedition, Aug-Dec 1874, Balfour 1123 (BM,K,PH).

### A S I A

I R A Q. Ghazi Garden, Baghdad, Anonymous, Rustin Exp. Farm 10087 (K).

S A U D I A R A B I A. Arabia, Carter s.n. (E). ADEN: Grounds of Federal Regular Army Officer's Mess, Khormaksar, sea level, 12-3-1967, Smith & Lavranos 5 (K); Fort Morbut, Waring 145 (K); Al Huseini, N of Lahej, escapee, 450 ft, 25-30 Nov 1937, Scott & Britton 273 (BM). YÉMEN: Hille, Gebel Bura, 31 Dec 1888, Schweinfurth 260 (G-3 sh.); Horjeilah, Wadi Chaba, 500 m, 1887, Deflers 145 (G).

P A K I S T A N. SIND: Karachi University Botany Department, 9-4-1969, Laidi 60 (MO); l.c., 5-4-67, Husain s.n. (NY); cult. Karachi, Oct 51, Jafri s.n. (BM).

I N D I A. Anonymous s.n. (MPU-17); Banks s.n. (W); Boquert s.n. (G); Sharp s.n. (W); Thunberg s.n. (S); *Indes orientalis*, Dec 1830, Dalhousie s.n. (G); l.c., Koenig s.n. (BM); l.c., Heyne s.n. (BM); l.c., hb. Porsen..berg 1352 (W); l.c., Oct 1796, Rattler 50 (M); NW India, Stewart s.n. (G) 6 mi on the Dhurmarroa (?), E India, Aug,

Ritchie 172 (E); Bejwapalli [?], 26 Nov 1913, Haines 5244 (\*K);  
 Central India, King s.n. (\*W); W. Himalaya, Duthie s.n. (K);  
 Tittaghur, 16 Jan 1912, Millspaugh 3116 (F). ANDHRA PRADESH:  
 Sirkakulam, 150 m, 8-9-62, Balatuishnan 1010 (\*FLAS); Ellora Hills,  
 Deccou, Ralph 250 (G). ASSAM: Cachar, Sep 1873, Keenan s.n. (K).  
 DELHI: Delhi, Aug 1952, Lata s.n. (UC); l.c., 23°38'N-77°12'E,  
Johri s.n. (FLAS); l.c., Roshnara Gardens, 7 Nov 1954, Kunar s.n.  
 (NY); l.c., Dec 1954, Dewan s.n. (U); University campus, Delhi, 28  
 Oct 1955, Sawhney 89 (WIS); University ridge, Delhi, 7 Aug 1955,  
Malile 41 (F). GUJARAT: Ahmadabad Dist., Bombay, 1922, Lascton (?)  
3316 (CGE). KARNATAKA: Ramagiri, Closepet, 25 Oct 1944, Venkatesh  
s.n. (S); prope urben Mangalor, terr. Canara, 1847, Hohenacker 117  
 (BM,G,K,M,W): Yalrigi, Dharwar Dist., 2000 ft, Feb 1919, Sedwick 5351  
 (K); Darwar jungles, Aug, Wight 870 (mixed with f. albiflora: BM,CGE,  
 E-mixed,G-hb. de Candolle, NY. non: E,G,HAL,S). KERALA: Cannanore,  
 1833, Campbell s.n. (E); Trivandrum, 18 Feb 1934, Erlansen 5404A (W).  
 MAHARASHTRA: 1-11-1959, Balapure 66149 (\*M); Chanda Dist., 26 Nov  
 1913, Haines 5900 (\*K); Raburi, Ahmदनagar Dist., Aug 1919, Nana 6256  
 (K); cult. Bibi, Khed taluka, Poona Dist., 17 Sep 1960, Rao 66106 (BM);  
 Poona, College Bot. Garden, Nov 1888, Anonymous s.n. (E). ORISSA:  
 Palaspal, Keonjhar State, 2 Oct 1939, Mooney 1158 (K). PUNJAB:  
Drummond 24631 (K). TAMIL NADU: Maisor & Carnatic, 1860, Thompson  
s.n. (BM,CGE,G,M,NY,S,U,W); Palar, South Arcote, 7 May 1907, Barber  
8307 (K): Hosur Taluk, Salem Dist., 3000 ft, 9-6-32, Kanothyeshoda  
229 (A,NY): Periakulam, Pulney Hills, Madura Dist., 1000 ft, Nov  
 1925, Anglade s.n. (G,UC); Pulneys, Evershed s.n. (BM); Paruanadussa  
 (?), Madras (annotated), Jan 1836, Wight 733 (K,M-2 sh.,NY,S,W-2 sh.);

Madras, 21 Mar 1918, Rich s.n. (K). UTTAR PRADESH: Dehra Dun, 2200 ft, Aug 1898, Gamble 27155 (K); Moradabad, Jul 1843, Thomson 209 (BM, E,K); Dudhwa Range, upper Gangetic Plain, Dist. Kheri (Oudh), 11-4-1898, Inayat 21469 (K). WEST BENGAL: Bengal, Anonymous s.n. (F-2 sh.); l.c., Hooker & Thomson s.n. (CGE,F-2 sh.,M,NY-mixed, U-mixed, W141756 & 141757; non: NY,S,U,W18672); Calcutta, 1830, C.B.D. s.n. (E-79); l.c., Dalhousie s.n. (GH); l.c., Mar 1878, Gamble 5836A (K); cult., hort. bot. Calcutta, 1865, hb. de Candolle s.n. (\*G); l.c., Griffith s.n. (CGE); l.c., Wallich 5344H (BM,CGE-2 sh.,E,G,not K); Bengal, Gangetic Plain, Dist. Houghly, 9 Feb 1877, Watt s.n. (E) and 14 Nov 1878, Watt 300 (E).

B A N G L A D E S H. Dacca: 25 Mar 1863, Clarke 6691 (BM).

S R I L A N K A (CEYLON). 1773, Burmam 74 (G) and 75; Burmam 109 (G); 1841, Kelaarb 61 (G-mixed); hb. Schmiedel s.n. (\*M); Thomson s.n. (K); Ambagamawa, ca 3000 ft, 30 Sep 1930, deSilva 87 (NY); Taldena, Mar 1890, Deschamps 2 (G); Akuramhadda, Aug 1890, Deschamps 2 (G); Ruhuna Nat. Park, Block I, Patanagala, 28 Oct 1968, Wirawan 699 (MO-2 sh.). CENTRAL: Peradeniya, 1572 ft, 9 Dec 1930, deSilva 98 (NY); Galagedera, Kandy Dist., 19 Mar 1970, Rudd 3316; Kandy, near hospital, 3 Feb 1970, Rudd & Balakrishnan 3064 (MO). EASTERN: Trincomalee, Aug 1860, Anonymous s.n. (E-81); l.c., Aug 1860, Dunbar s.n. (E). NORTHERN: Jaffna, 1941, Bates s.n. (GH). SOUTHERN: ca 1.5 mi beyond Tissa resthouse on road to Kataragama, Hambantota Dist., 9 Feb 1970, Rudd 3106 (MO,NY). WESTERN: Kochikade, 10 Apr 1931, Simpson 7959 (BM); Puttalam Dist., shrub W of Pomparippa in sanctuary, 2 Jun 1972, Maxwell & Jayasuriya 804 (MO).

A N D A M A N I S L A N D S. PORLOB ISLAND: Feb-Mar 1934, Ram 3742 (E).

B U R M A. Brandis 1307 (CGE-mixed). PEGU: Rangoon, 18 Jul 33, Dickason 5696 (W); Victoria Lake, Ragoon, 26 Sep 1925, Valentin s.n. (S); Thandaung, Rangoon, Oct 1934, Dickason 5202 (W); Oukkan, Pegu, McLelland s.n. (\*K). UPPER BURMA: MAGWE: Minbu District, Nov 1902, Mokim 546 (G); l.c., 10 Aug 1909, Lace 4919 (E,K). MANDALAY: Kyaukmagyi, Meiktila District, 28 Oct 36, Smith 13750 (K); Mandalay, 10-11-50, White 42 (UC).

T H A I L A N D (SIAM). 1872, Bradley 99 (GH-mixed,PH-mixed,UC); Anonymous s.n. (W). CENTRAL: Authaya, 23 Nov 56, Bolinger s.n. (NY,U); Bagkok, 1929, Wall s.n. (S); Bangkok, 1899, Zimmermann 5 (M,U-mixed; non BM,G,PR,U); Tha Luang, 75 mi N of Bankok, 1924, Smith s.n. (GH). NORTH: Chieng mai, 1000 ft, 16 Jun 1912, Kerr 1530 (BM) and 300 m, 1530B (BM,E); Prae, 27 Oct 1929, Franck 103 (S); Den Chai, Prae, 1 Oct 1929, Franck 113 (GH).

M A L A Y S I A. Pulo Penang, Beck s.n. (W); Pulo-Pinang, 1835, Delessert s.n. (G); Malacca, Griffith s.n. (CGE) and 1728 (K); Singapore, 1886, Beck s.n. (W); Singapore, Penang, 1830, Walker 117 (G); Combang Talong, Burmann s.n. (G).

L A O S. Bassac, 1866-1868, Thorel s.n. (F).

S O U T H V I E T N A M. COCHINCHINE: 1862-1866, Thorel s.n. (A,F); cult., Germain s.n. (\*F); fluv. Mekong, Dec 1867, Pierre s.n. (E,F) and Dec 1868, Pierre s.n. (G); hort. Bot. Garden Saigon, Anonymous s.n. (GH); l.c., Dec 1868, Pierre s.n. (A); ad Thu Dau Môt, Aug 1867, Pierre s.n. (F,G); Long-Than, 1862-1866, Thorel 37 (BM,E);

Tourcham, Phanrang prov., May 1918, Kloss s.n. (BM); village So Phusc Duong, prov. So Ninh Thuan, Aug 1935, Pételot 2168 (GH).

C H I N A. Henry s.n. (\*NY). HONG KONG: 13 Sep 1893, Bodinier 668 (E); pres Bethanie, 13 Sep 1893, Bodinier 89988 (MPU); 6 Jul 1891, Delavay s.n. (K-2 sh.); Forbes s.n. (BM). KWANGTUNG: cult. Canton, 13 Oct 52, Anonymous 3552 (U 64741B).

T A I W A N (FORMOSA). Apr 1934, Yamada s.n. (S); Takao, 11 Sep 1930, Tanaka 5440 (BM,NY); l.c., Henry s.n. (NY); Takao Gau, Apes Hill, 5-6-1912, Price 588 (K); Boryo to Kurara, Hoshun prov., 15 Nov 1918, Wilson 10995 (A).

#### P H I L I P P I N E S   A N D   I N D O N E S I A

P H I L I P P I N E S. de Samboangeon (?), 1819, Perrottet s.n. (G). LUZON: Cuming 616 (BM,CGE,E,G-2 sh.,NY,W); Pangasinon, Dec 1907, Ramos 4951 (GH); Manila, Blanco 394 (GH,NY,W; non: A,BM,F,MO, W); l.c., Oct-Dec 1904, McGregor 46 (NY); l.c., Oct-Nov 1903, Merrill 3439 (NY); l.c., 5 Nov 1911, Millspaugh 2814 (F); l.c., 1879, Rothdauscher s.n. (M-2 sh.); l.c., Carborn Swamp, May 1907, Day 42 (MO); Manila, Malate, Oct-Dec 1925, Buensuceso s.n. (PH-mixed); prov. Cagayan, Mar 1909, Curran 16743 (E); Los Baños, prov. Laguna, 15 Jan 1905, Williams 2057 (GH,NY-2 sh.) and 3071 (NY); Pansol, Laguna, 19 Apr 1913, Gates 7194 (F); prov. Laguna, Jul 1964, Quisumbing 1996 (BM,G,GH); Bauang, prov. Union, Feb 1904, Elmer 5576 (G-2 sh.,NY,PR). CEBU: Maelan, Jan-Feb 1875, Moseley s.n. (BM). MINDANAO: Davao, Dist. Davao, Mar 1904, Copeland 449 (NY); Mati, Dawan streams, Davao prov., Mar-Apr 1927, Ramos & Edano 49125 (S,UC-mixed).

B O R N E O. 1884, Grabowsky s.n. (BM). BRITISH NORTH BORNEO:  
Kudat, Mount Kinabalu, 20 Dec 1915, Clemens 9553 (BM,GH); Banquey  
Island, 20 ft, Jul-Sep 1973, Castro & Melegrito 1587 (G,UC).

C E L E B E S. Bonerate, 30 m, 8-5-1913, Leeuwen 1434 (U);  
Lamala, Tongke, Sep 1919, Kaudern 371 (S); Boulaauy-Mongondon,  
Motoukat, N. Celebes, 23 May 1917, Kaudern 116 (S); Boeton, 50 m,  
12-10-1929, Kjellberg 143 (S); Bouthain, Jan 1930, Kjellberg 3092 (S).

S U M A T R A. Korthals s.n. (K,U,W). EAST COAST: Asahan, 20  
Jun 1918, Bartlett & LaRue 168 (GH); Ria na Paso, between Djoema  
Tombak & Taratak, Tanah Djawa, Simeloengoen, 7 Jun 1923, Bartlett 8278  
(NY); Goenoeng Soeasah, near Rantau Paraput, Bila, 27 May 1932, Toroos  
2343 (GH,UC).

C H R I S T M A S I S L A N D. escapee at drumsite, South  
Point, 50-800 ft, 28 May 1968, Powell 13 (K).

J A V A. signatures illegible (W 359350, 2 collections); Burmman  
256 (G) 1768-71, Cook's 1st Voyage, Anonymous s.n. (BM); Hoffmansegg  
s.n. (HAL); Horsfield 12L (CGE); 1759, Klinting s.n. (G); Reinwartz  
s.n. (S); hb. Ventenant s.n. (G); 1838, Webb s.n. (G); Zollinger 45  
(BM,CGE,G-4 sh.,S); SE Java, 1880, Forbes 1230C (BM); W Java, Apr  
1818, hb. Tandry s.n. (W); hort. bot. Bogor, 5 Apr 1893, Hallier D340  
(G); l.c., 1872-3, Wawra 1331 (W); Batavia, 27 Mar 1839, Anonymous 72  
(E); l.c., Horsfield s.n. (K); ..elknede (?), 1902, Backer s.n. (U);  
Buitenrorg, Tjidepet, 28 Apr 1922, Brink 1056 (U); Semarang, 20 Nov  
1882, Cooper s.n. (U); furn culturuuschool, Malang, 400 m, Groenhart  
70 (U); Turrchen ruigto Waterval Baong by Lawang, O. Java, Groenhart  
112 (U); Madoera pris dans de..(?)... cultivate in Buitensorg, 31 Jan



Figure 69. Australasian distribution of Clitoria ternatea, subgenus Clitoria. Var. ternatea f. ternatea (●).



1905, Hochreutiner 2803 (G); Lengi teleng, 1837, Hoffmansegg 125 (G);  
Suro kerto, Horsfield s.n. (BM).

T I M O R. Anonymous s.n. (G-184; K-137); hb. Baner 88 (W);  
1830, Gaudichaud s.n. (G); hb. Moricand s.n. (G); Kollarro seaside,  
Wahby (?) 254 (BM); 1789, Nelson s.n. (BM).

W E T A R I S L A N D. Nusa Tenggara, Meta Lakela to Ilwaki,  
1-100 m, 8-9 Apr 1939, Bloembergen 3672 (NY).

M O L U C C A N I S L A N D S. cult., Anonymous s.n. (W).  
TANIBAR ISLANDS: Jamdena, Laurang, 11 Apr 1956, Waalkes 3346 (A).

#### A U S T R A L I A   A N D   P A C I F I C   I S L A N D S

A U S T R A L I A. New Holland, H.H.J. s.n. (CGE); Rositer's,  
Mar 1910, Morrison s.n. (E). NORTHERN: Humpty Doo Experimental Rice  
Farm, Darwin, 23 Dec 1971, Redhead B192 (K); Arnhem Land Aboriginal  
Reserve, Nightcliff, Darwin, 12°22'S-130°53'E, 22 Mar 1948, Specht 31  
(A,K). QUEENSLAND: Gaynah below Duke & Duchess Hills, Burnett  
District, 10-5-1956, Fox s.n. (\*NY); Townsville, N Kennedy Dist.,  
13 Jan 1968, Henderson H324 (K). WESTERN AUSTRALIA: Kalumburu  
Mission, Kimberleys, 10-12-52, Broadbent 52 (BM).

M E L A N E S I A. NEW GUINEA: Northeast New Guinea: Kiapit,  
Morobe Dist., hb. Forest Dept., Anonymous 2646 (K); Markam River, Lae  
Subdistrict, Morobe District, sea level, 26 Nov 1967, Coode 32579 (E);  
Erap, Morobe Dist., Sep 1953, Womersley 5383 (A,K). Papua: Basima,  
Cape Vogel, Baniara Subdistrict, Eastern Dist., 100 ft, 11 Sep 1954,  
Saunders 125 (A,K); ca 1 mi N of Rigo, Central Dist., 20 ft, 13 Aug  
1962, Schodde 2774 (A,E,G,K); Port Moresby, 50 ft, 10-4-35, Carr 11812  
(BM,K); ca 0.5 mi E of Delena Village, Kairuku Subdistrict, Central

Dist., 50 ft, 9 Aug 1962, Darbyshire 790 (A,K); Daru Island, Western Division, 9 Mar 1936, Brass 6294 (A,BM). SOLOMON ISLANDS: Tenasn, coconut plantation, Tenasn, Guadalcanal, sea level, 13 Nov 1954, Brown W117 (BM). NEW CALEDONIA: in garden, Noumee, Aug 1884, Grunow s.n. (W); Noumie, 4 m, 23 Feb 1950, Guillaumin 8546 (A); Nouméa, Mar 1914, Franc 820A (G,GH,K,NY); Caricaté St. Vincent, 13 Aug 1924, Däniker 764 (S). FIJI ISLANDS: 15 Jan 45, Parham 5158 (A); E slope of main ridge, Karo, 100 m, 29 Jan-5 Feb 1934, Smith 1028 (NY); Lautoka, 10 Oct 20, Greenwood 145 (K); Sawaeke, shore of Herald Bay, Ngau, 0-30 m, 24 Jun-5 Jul 1953, Smith 7894 (NY,S,UC); Fidschi, Suva, Aug 1932, Meebold 16504 (M); Water Bay, Lausi R. near Suva, prov. of Rewa, Viti Levu, Apr 32, Parham 51 (BM); Hot Springs, Tavua, Nadarivatu, Viti Levu, alt. 100, Oct 1907, Gibbs 878 (BM).

M I C R O N E S I A. MARIANA ISLANDS: Guam: Asan Point, Civilian Camp, 1 m, 23 Aug 1949, Anderson 4 (NY); 0.5 mi N of Asan, 27 Jan 1945-46, Moore 252 (UC); Guam Experimental Station, 191-, Thompson 252 (NY). Rota: 50 ft, 27 Jul 1946, Grether 4447 (K,UC). Saipan: S of Puntan Magpi, NW coast, 30 m, 5 Feb 1950, Fosberg 31329 (NY). Tinian: Spring 1945, Knight 112 (FLAS); 2nd terrace E of Mt. Lasso, East Side Island, 100 m, 13 Jun 1946, Fosberg 24923 (NY). CAROLINE ISLANDS: Palau Islands: old seaplane base on W side of Ngarakabesang (Arakabeson) Island, 2-5 m, 23 Mar 1950, Fosberg 32283 (NY). GILBERT ISLANDS: Tarawa Island: Betio, 4 Oct 1967, Adaire 44 (K).

P O L Y N E S I A. HAWAIIAN ISLANDS: Oahu: cult. Honolulu, May 1943, Meebold s.n. (GH,M); l.c., 1 Feb 1931, Inafuku s.n. (NY-mixed); l.c., University of Hawaii, 11 Dec 1929, Degener 17958 (NY); college

grounds, Rock s.n. (A-2 sh.). SAMOA: Reinecke 148 (\*G); Upolu, 1905, Rechinger 1256 (NY,W) and 1578 (W). TONGA: Nomuka: near the sea on road to village, 30 Apr 1953, Yuncker 15810 (BM,G,GH,U,W). Haapai: Uiha, sea level, 30 May 59, Soakar 541 (K). SOCIETY ISLANDS: Tahaiti: 27 May 1922, Setchell & Parks 168 (GH,UC,W); Sep 1852, Andersson s.n. (S-2 sh.); Papeete ach Fatuahua, 1852, Andersson s.n. (S).

3lab. Clitoria ternatea L. var. ternatea f. pauciflora Fantz,  
f. nov.

Inflorescence racemose, 3-6 flowered. Peduncles solitary, axillary, 1-4 cm long, base rigid with upper portion lax, slender. Flowers blue.

TYPE COLLECTION: SENEGAL. ca 8 km N of Dakar near Ngor, 28 Aug 1962, Broadbent 14 (HOLOTYPE: K-159.).

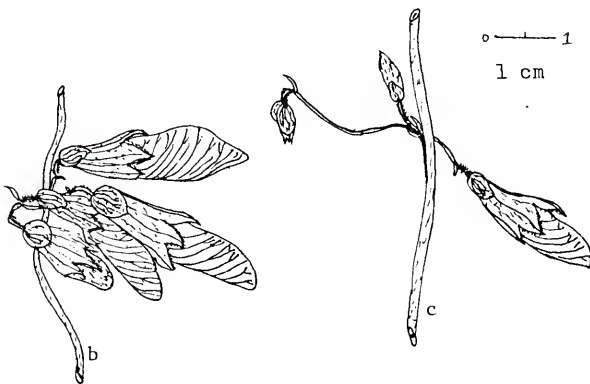
NOTES: This form is conspicuous and easily recognized by the more primitive type of inflorescence, a racemose axis with several flowers.

DISTRIBUTION (Figure 67): Known only from the type locality.

3lac. Clitoria ternatea L. var. ternatea f. fasciculata Fantz,  
f. nov.

Peduncles 1-4 per axil, fascicled, typically (0.5) 1-4 cm long, base rigid with upper portion lax, slender. Flowers blue, solitary at apex of peduncle, rarely biflowered.

Figure 70. Clitoria ternatea - II. Var. ternatea f. pauciflora:  
(a) node with leaf and inflorescence, x 1. Var. ternatea  
f. fasciculata: (b-c) two nodes with fascicled  
inflorescences, x 1. (Broadbent 14, K-159: a. Yuncker  
17313, MO 1717338: b-c.)



TYPE COLLECTION: JAMAICA. St. Andrew Parish. Thicket along Mona Road, 550 ft, 8 Nov 1957, Yuncker 17313 (HOLOTYPE: MO 1717333. ISOTYPES: F 1478717, G-335, MICH, S).

Yuncker 17313 had better material and was not mounted with other collections on one herbarium sheet as are the other collections cited. Nodes with only one inflorescence frequently have immature branchlets present, as do the Field Museum and Stockholm specimens which are poorer representatives of the fasciculate condition.

DISTRIBUTION: Known only from a few widely scattered localities, either as a cultivar or found naturalized (?) in localities where the species had been introduced.

I N D I A. pr. Madura [?], Griffith 208 (CGE). WEST BENGAL: cult. Calcutta, Wallich 5344H (K; not BM, CGE, E, G).

F I J I I S L A N D S: Lantoka, 10 Oct 1920, Greenwood 145 (K).

3lad. Clitoria ternatea L. var. ternatea f. albiflora (Voigt)

Fantz, comb. nov.

Ternatea flore simplici albido Tourn., Mem. Math. Phys.

Acad. Roy. Sci. Amsterdam 105. 1706; nom. illeg.

Flos clitorius, flore albo Burm., Zey. 100. 1737;

nom. illeg.

Clitoria foliis pinnatis L. var.  $\alpha$ , Hort. Cliff. 360.

1737; nom. illeg.

Clitoria foliis pinnata L.  $\beta$  Flos clitorius, flore alba

(Burm.) L., Fl. Zeyl. 130. 1747; nom. illeg.



Ternatea flore simplici albido Tourn. ex Mill., Gard.

Dict. ed. 4. 3: TERNATEA. 1754; nom. illeg.

Clitoria ternatea L.  $\beta$  eadam foliolus obtusioribus, flore albido Lam., Ency. Bot. 2: 50. 1786; nom. illeg.

Clitoria bracteata Poir., in Lam. Ency. Bot. Supp. 2:

301. 1811.

Clitoria ternatea L.  $\beta$  bracteata (Poir.) DC., Prod. 2:

234. 1825.

Nauchea ternatea Desc. var., Mem. Soc. Linn. Papers 4: 8.

1826; nomen nullus.

Nauchea bracteata Dupuis ex Desc., Mem. Soc. Linn. Papers

4: 11. 1826.

Clitoria ternatea L.  $\beta$  alba Sweet, Hort. Brit. 2nd ed. 140.

1830; nomen nudum.

Clitoria pilosula Wall., Cat. Herb. Ind. 186 no. 5347.

1831-1832; nomen nudum.

Clitoria ternatea L.  $\alpha$  ternatea flo. alba Boj., Hort.

Maurit. 91. 1837; nom. illeg.

Clitoria ternatea L. D. fl. albo Hasskarl, Cat. Hort.

Bog. Alt. 275. 1844; nom. illeg.

Clitoria ternatea L.  $\beta$  albiflora Voigt, Hort. Calcuttensis

213. 1845.

Clitoria pilosula Wall. ex Benth., Journ. Linn. Soc. 2:

37. 1858.

Clitoria ternatea L. var. pilosula (Wall. ex Benth.)

Bak. in Hook. Fl. Brit. Ind. 208. 1879.

Clitoria albiflora Mattei, Boll. Bot. Palermo 6: 97.

1908.

Clitoria ternatea L. var. alba Berhaut, Fl. Senegal 47.

1954; nom. illeg.

Clitoria ternatea L. var. flore albo Aiudie, nom. in sched.

Clitoria timoriana, nom. in sched.

Flowers white with vexillum greenish or greenish-white medially, solitary or rarely biflowered, borne at the apex of rigid, short (0.5-1.5 cm), solitary peduncles.

TYPE COLLECTION: INDIA. Bengal, Capt. Jenkins s.n. (NEOTYPE: Hb. John Ball, E-57).

White-flowered individuals have been reported in the literature since 1706, often noted as a variety. Names applied to this white-flowered group are generally illegitimate in accordance with the International Code of Botanical Nomenclature (1972). Those names published prior to 1753 were invalidly published, hence illegitimate. Most names published after 1753 were either polynominal names, or the published name lacked a description, hence illegitimate. Descourtilz (1826) noted a variety and described it, but he did not provide a name for it:

The only distinction between this group and that of the typical ternatea is the flower color, i.e. white flowers instead of blue flowers. This is a minor variation, thus better treated as a form instead of a variety. No forma names have been published for this group. Two epithets previously published are available for use.

The epithet bracteata was published at the species level by Poirét (1811) and reduced to varietal status by de Candolle (1825). The epithet albiflora was published by Voigt at the varietal level.

Voigt's name was chosen for the form name to reflect the morphological distinction. Poirét's name was rejected since it has no meaning presently within the species, and because priority does not exist outside of its own rank, there is no obligation to use Poirét's older name.

Voigt listed and described the cultivated plants of Calcutta, in the Bengal territory of India. He did not designate any type collection. There is no evidence to indicate whether he collected specimens of the Calcutta cultivar or whether he had based the name on specimens he had examined that were collected by others. Therefore a neotype has been selected.

The white-flowered form of C. ternatea is more common in the Indian subcontinent than in other portions of the range. Specimens collected from Bengal were given higher priority in the selection of the neotype to more closely match Voigt's plant. Jenkins s.n. had the better representative material, including a mounted, open white flower, and did not include a mixed assemblage as did some of the other Bengal collections, and thus was selected as the neotype.

Variety pilosula has been treated historically as distinct from the white-flowered variety based upon smaller leaflets, fruits, and the pilose pubescence of the fruit. Examination of the type specimen (Wallich 5347: BM) shows that the smaller leaflets are agreeable with the leaves on younger shoots of many specimens of var. ternatea. The fruit appears distinct because of its smaller size and somewhat

heavier pubescence, and superficially resembles those of C. heterophylla. However, the calyx and leaflets are much larger than those found upon specimens of C. heterophylla, but agree with C. ternatea. Within C. ternatea, as the fruit matures, juvenile fruits are more densely pubescent because of the numerous trichomes found on the ovary. With age, these trichomes mostly shed leaving an indument of scattered subappressed trichomes. The size of the legumes also changes with age. First the ovary elongates, then rapidly broadens, then it continues to elongate and widen slightly until mature. The fruit on the Wallich specimen is probably a juvenile fruit which has begun elongation (ca 3.5 cm) but has not yet broadened considerably (ca 6 mm). The fruit agrees in size and pubescence with juvenile pods of C. ternatea specimens, therefore, the name pilosula is best treated in synonymy.

ECONOMIC IMPORTANCE: Several authors have made specific reference to the white-flowered form when they indicated the medicinal importance of the species. Details are provided in the chapter on Economic Importance.

NOTES: The white-flowered form is easily distinguished from the azure to purple flowers. However, it often becomes difficult to distinguish the white-flowered members from those with pale blue flowers in the dried state. Specimens noted by collectors as bearing blue flowers normally dry with the blue to purplish color conspicuous. Pale blue flowers tend to lose the pigmentation in the dried state and appear a light yellowish-brown, or darker if the flower is complicate (cf. Darbyshire 790). White flowers lack the pigmentation and appear whitened, or dry to a pale yellowish tint. When the petals begin to

shriveled, they become darkened peripherally and the degree of yellowishness becomes difficult to determine.

This form can be distinguished easily from the white-flowered variety angustifolia by the lack of the narrow, elongated leaflets and the larger flowers.

DISTRIBUTION (Figures 65 to 69): The white-flowered form is found in isolated populations throughout the pantropics, and commonly in cultivation. The frequency of occurrence is very small when compared to the typical blue-flowered form.

L O C A L I T Y    U N K N O W N. Cult., Anonymous s.n. (W,W 191797, W 359354); Burmann s.n. (G-2 sh.); de Moscon, 1885, Demidoff s.n. (MPU); Faragl (?), Figari s.n. (MPU-mixed); 1780, cult. Erlanger s.n. (M); 1830, Leprier s.n. (W); Moukorrhiva, Marguise (?), 1857, Linormand s.n. (MO); Nookahiva, hb. Johs (S); Miller s.n. (BM); Roxburgh s.n. (E); Richard s.n. (P); de Signeux s.n. (G); hb. Schreber s.n. (M); Telampur, hb. Schreber s.n. (M); hb. Schwoegrichen s.n. (M); hb. Vaillant s.n. (P); 1837, Ward s.n. (E); hb. Wood-Cooke s.n. (NY).

#### N O R T H    A M E R I C A

U N I T E D    S T A T E S. FLORIDA: MONROE: Key West, 19 Mar 1930, Moldenke 805 (MO,NY,PENN,S,W). ILLINOIS: COOK: cult. greenhouse, University of Chicago, Chicago, Aug 1916, Hill s.n. (MO).

M E X I C O. CHIAPAS. Cult. Acala, 31 Jan 1946, Hernandez 1013 (GH); cult. Escuintla, 12 Jun 1947, Matuda 16425 (F).

B E L I Z E (BR. HONDURAS). Corozal Dist., 1931-1932, Gentle 167 (F,MICH-2 sh.,MO,NY).

G U A T E M A L A. PETEN: La Libertad, 9 Jun 1932, Lundell 3731 (F,MICH).

W E S T I N D I E S

L O C A L I T Y U N K N O W N. Indiae occid., 1909-1910, Boldingh 6330 (U); cult. l.c., Boldingh 5213 (U).

C U B A. prope de la Lagra, Anonymous 155 (W). HAVANA: Havana, Jun 1916, Meredith s.n. (PH-mixed); prope l.c., 1862, Schatela s.n. (F); Vedado, 19 Aug 1910 (NY).

C A Y M A N I S L A N D S. CAYMAN BRAC: on bluff near Tibbett's Turn, 40-80 ft, 10 Nov 1968, Proctor 29353 (BM).

J A M A I C A. 1850, Alexander s.n. (NY). ST. CATHERINE: Spanish Town, Anonymous s.n. (E). ST. ANDREWS: cornfields, Malines, Jan 1846, hb. McNab s.n. (E-mixed,GH).

S O U T H A M E R I C A

C O L O M B I A. MAGDALENA: Zunnum & Barranquilla, hb. Lehmann 1799 (F); Mamatoca, Santa Marta, 150 ft, 15 Oct 1898, Smith 680 (NY).

V E N E Z U E L A. CARABOBO: Naguanagua, cerca de Valencia, cult., 7 Apr 1946, Burkart 16282 (VEN). MONAGAS: Jusepin, 29 Aug 1970, Aristeguieta & Virrueta 7641 (VEN).

N O R T H E R N A F R I C A

S E N E G A L. Aug 1827, Mr. M. s.n. (MPU); 1837, Heudelot 437 (G-2 sh.,K,W); Dec 1823, Roger s.n. (K); E. Senegal, Dupruis s.n. (S); prope Dakar, Apr 1829, Leprieur s.n. (G); Dagana, Mar-Sep 1825, Leprieur s.n. (G-2 sh.).

S I E R R E L E O N E. NORTHERN: Musaia, May 1957, Barter s.n. (K).

S O M A L I A. Geuale, terr. dei liberti Binial, It. Somalai, 10 Sep 1933, Tuckert 108 (K). BENADIR: Bano Uebi Sebeli, Merca, 6 Oct 1936, Ciferi 7 (K).

# S O U T H E R N A F R I C A

A N G O L A. CUANZA NORTE: Ambiz, Jan 73, Anonymous s.n. (W 144339). LUANDA: Dist. Loanda, May 1901, Gossweiler 25 (K).

Z A I R E (BELGIUM CONGO). KATANGA: Marunja, 1893, Gregory s.n. (B).

U G A N D A. NORTHERN: Kangole, 4500 ft, Sep 1949, Tweedie 772 (K).

K E N Y A. Bome River, 100 ft, 15 Mar 1902, Kassner 304 (BM); River Vena, 26 Feb 1902, Kassner 138 (K). CENTRAL: by River Thika, Mabuloni Rocks, near 01 Doinyo Sapuk Thika, 4000 ft, 12 Dec 1952, Verdecourt 846 (K,MO); Mathews Range, 01 Doinyo Lengio, 5000 ft, 20 Dec 1958, Newbould 3518 (K,S). NORTHERN: Dandu, 2500 ft, 4-5-1952, Gillett 13035 (K,S,W). SOUTHERN: Sultan Hamud, 22 Apr 1902, Kaessner 650 (BM); Uaso Nyiro River plain W of Lake Magadi, May 1936, Bush 9 (K).

T A N Z A N I A (TANGANYIKA). EASTERN: Meeresstrand bei Dar-es-Salam, 22 Aug 1958, Gilli 209 (W); Mafia Is., 31 Mar 33, Wallace 824 (K); Kilosa, Nov-Dec 1920, Swynnerton 89 (BM); Ugaza, Kilosa Dist., 24 Feb 25, Peter 32443 (S); bezirk Morogo, Uluguru-Gebirge, Parklandschaft, 600 m, 19 Apr 1933, Schlieben 3792 (MO,NY) or 3799 (BM,G-2 sh.,M-mixed,S); ostlicher Mahenge bezirkzwischen Mahenge

Plateau und Zusammenflutz von Kilombero (Ulanga) und Luwago zum Rufii, Parklandschaft, 400 m, 8 Jun 1932, Schlieben 2287 (K,M,S; non BM,G).

IRINGA: Iringa, 3000 ft, 18 Sep 1936, Emson 617 (K). NORTHERN: Kilimandojaro Nuwvalk Moranger (?), 800 ft, Apr 1894, Volgens 2162 (E,G,K): Himo, Moshi Dist., 4000 ft, Jul 28, Haarer 1521 (K); Lake Manyara National Park, 23 May 1962, Dingle HD255 (K); 8 mi S of Moshi, 2400 ft, 9 Oct 1964, Beesley 32 (K). SOUTHERN: Mtwara-Mikindani Road, Mikindani Dist., 13 Mar 1963, Richards 17864 (K). TANGA: Sawa, 12 Jul 1957, Faulkner 2025 (K,S); Kichanjani in Bweni area of Pangani town, 26 Feb 1957, Tanner 3456 (MO,NY,UC). ZANZIBAR: German E. Africa, 25 May 1916, Buchanan s.n. (BM); 1931, Vaughan 1046A (K); near Chukwani, sea level, 27 Dec 63, Faulkner 3333 (K-mixed).

Z A M B I A (NORTHERN RHODESIA). SOUTHERN: Mazobuku on Vet Research Station, 27 Dec 1962, Rensberg 1119 (K).

M O Z A M B I Q U E (PORTUGUESE EAST AFRICA). Peters 8 (K). SUL DO SAVE: Mongue, N of Moxixe, Inhambane Dist., 10 ft, 14 Jan 1954, Schelte 4424 (BM).

#### W E S T E R N   I N D I A N   O C E A N

C O M O R O   I S L A N D S. 1884, Humbolt 369 (BM,K).

M A S C A R E N E   I S L A N D S. MAURITIUS (ISLE DE FRANCE): 1828-1829, Belanger s.n. (G); Cambressedes s.n. (MPU); Commerson s.n. (E); Feb 1925, Mace s.n. (K); Neraud s.n. (G); Sieber 190 (HAL,M,PR): Sieber 349 (G,HAL): hb. Ventenat s.n. (G-2 sh.); Pamplémousse, May 1887, Taulay s.n. (NY,W).



A S I A

L O C A L I T Y U N K N O W N. Wallich 5344C (BM,K); Wallich 5344H (K-hb Benthon, non BM,CGE,E,G,K-hb Hooker); Pandeinah, Hügel 2933 (W). Sillet in Hb. Wallich 5344G (BM,K).

I N D I A. India or., Beauv. s.n. (PH); l.c., Leitz s.n. (M); hb. Wallich 5347 (BM); Ameraponna, Hamilton s.n. (BM); prope Mulki, Canara Terr., 1847, Hohenacker 267 (A,BM,G-2 sh.,M). ANDHRA PRADESH: Dhone, Kurnool Dist., Madras, 1902-3, Lushington s.n. (K); Madras, Roxburgh s.n. (K). DELHI: 30 Aug 1952, Konar 42 (NY). GUJARAT: Banks of Khistras River, Dewar Sehore, Oct 1834, Campbell s.n. (E). KARNATAKA: Darwar jungles, Aug, Wight 870 (E-mixed,G,HAL,S: non BM, CGE,G-hb. de Candolle, NY). KERALA: Malabar concan vc., Stocks & Law (BM,CGE,G-mixed,W). MAHARASHTRA: Bombay, 1835, Roos s.n. (G). TAMIL NADU: Trivandrum, Trarancore, 18 Feb 1934, Erlanson 5404 (NY,W); Pondicherry, 1835, Perrottet s.n. (E-2 sh.). WEST BENGAL: Bengal, Hooker & Thomson s.n. (NY-mixed,S,U-mixed,W); l.c., 1883, Pierre s.n. (E).

B A N G L A D E S H. CHITTAGONG: beside pagoda, Cox's Bazar, Bengal, 31 Oct 1943, Sinclair 3335 (E).

S R I L A N K A (CEYLON). Hermann s.n. (M-2 sh.); 1841, Kelaarb 61 (G). CENTRAL: Kandy, near hospital, 488 m, 3 Feb 1970, Rudd & Balakrishnan 3063 (MO). SOUTHERN: Nazone a Karrouch prope Kirinda, 8 Nov 1866, Anonymous s.n. (W).

B U R M A. PEGU: Kamayut, Rangoon, 25 Aug 32, Parkinson 14813 (GH).

T H A I L A N D (SIAM). ca 1872, Bradley 99 (GH-mixed, PH-mixed. non: UC); 1899-1900, Schmidt 253 (M). CENTRAL: Bangkok, Oct-Dec 1897, Hasse s.n. (BM); l.c., 1899, Zimmermann 15 (G-2 sh., M, MO, PR, S, U, W) and 156 (G-2 sh., M, MO, PR, S-2 sh., U, W). NORTH: Den Chai (Prae), 1 Oct 1929, Franck 104 (S). SOUTH: near Klong, Nov 1921, Smith 161 (BM).

C H I N A. HAINAN: 23 Oct 1933, Wang 34839 (NY, S); Sam Ah, 1932-33, Chun & Iso 43329 (NY).

### P H I L I P P I N E S   A N D   I N D O N E S I A

P H I L I P P I N E S. LUZON: near highway 54, Kamuning, Quezon City, 50 m, 24 May 1951, Digen 51 (A); Manila-carborns, Rizal prov., 2 m, May 1907, Day 44 (MO). PALAWAN: Dec 1905, Bermejos 199 (GH, NY).

B O R N E O. BRITISH NORTH BORNEO: Aug 1919, Agama 532 (A, UC).

J A V A. Blume s.n. (NY-2 sh.); 1819, Perrottet s.n. (G); hort. bot. Bogor., ca 1872, Wawra 1330 (W); l.c., Anonymous s.n. (U); Cambang Selan, Burmman s.n. (G); prope Aniol in monte Mondjknong, Nov, Anonymous s.n. (K).

### P A C I F I C   I S L A N D S

M E L A N E S I A. FIJI ISLANDS: cult. A.S.S. Nacocolevu, Nadroga, 20 Jan 1961, Koroiveibau 12317 (K).

31b. Clitoria ternatea L. var. angustifolia Hochst. ex Bak. f.,  
Leg. Trop. Afr. 428. 1929.

Clitoria zanzibarensis Vatke, Oestr. Bot. Zeitschr. 28:  
261. 1878.

Clitoria tanganicensis Micheli in Dur. & DeWild, Bull. Soc.

Roy. Bot. Belg. 36(2): 60. 1897.

Clitoria mearnsii DeWild, Rev. Zool. Bot. Afr. 13, Supp.

Bot. 8: 8. 1925.

Clitoria tanganyicensis Micheli err. cal. ex Bak. f., Leg.

Trop. Afr. 429. 1929.

Clitoria ternatea L. var. angustifolia Hochst., nom. in sched.

Clitoria ternatea L. var. stenophylla Welw., nom. in sched.

Clitoria ternatea L. f. heterophylla Welw., nom. in sched.

Leaflets elongate, narrow, typically 4-15 (25) mm wide, length/width ratio (2) is 2.6-9.0:1, linear, lanceolate, oblong, lanceolate-oblong, or occasionally narrowly elliptic (leaflet size minute), apex obtuse, base rotund; pubescence on upper surface uncinat, dense to scattered, becoming glabrate, macroscopic trichomes lacking. Bracteoles highly variable, 4-11 mm diameter or occasionally to 16 mm diameter. Flowers small, (2.5) 3-4 cm, typically white or white with vexillum having a peripheral narrow strip of blue.

The narrow-leaflet variety can be distinguished from the typical variety by its narrow, elongated leaflets and small flowers.

TYPE COLLECTION: ETHIOPIA. Fluvium Tacaze prope Djeladjeranne, Abyssinia, Sep 1841, Schimper 1617 (LECTOTYPE: BM. Isolectotypes: CGE, G-437, hb. Moricand, G-467, hb. de Candolle, G-495, K-13, hb. Hooker, M 12476, MO 2182506, MPU, RB 157932, W). SYNTYPE: valle fluvii Tacaze, Abyssinia, Aug 1841, Schimper 1736 (BM, G-2 sh., GH, K, M, W).

There is considerable variation in the leaflet width and bracteole size. In general, a gradient occurs between Eastern Africa and Northeastern Africa. Individual specimens generally increase in leaflet size and bracteole size as one moves north along the gradient. Types of C. zanzibarensis and C. tanganicensis represent the lower end of this size range. Leaflets are linear to linear-oblong, typically 4-12 mm wide, and bracteoles are small, typically 4-6 mm long. The Schimper collections represent the upper end of the size range. Leaflets are lanceolate to lanceolate-oblong, typically 8-25 mm wide, and bracteoles are highly variable, commonly 8-11 mm long with some flowers having conspicuous, suborbicular bracteoles to 16 mm in diameter. Collections similar to the Schimper collections (which include the type) are in the minority. The type of C. mearnsii represents the intermediate size which is very common. Leaflets are basically oblong, 7-15 mm wide with occasional leaflets becoming wider to 20 mm. Bracteoles typically range from 6-11 mm. Leaflet pubescence on the upper surface also follows this north-south gradient. Smaller sized leaflets are typically densely pubescent with uncinata trichomes. As leaflet size increases, the uncinata trichomes become scattered over the upper surface. Larger leaflets become glabrate with the uncinata trichomes confined mainly to the major nerves.

Baker published Hochstetter's name angustifolia based upon two syntypes, Schimper 1617 and 1736. Both collections were distributed with the varietal name. Either collection is representative of the group, although each represents the upper limits of leaflet and bracteole size, and glabrate pubescence of the upper leaflet surface.

The British Museum specimen chosen as the lectotype was more representative than other specimens.

DISTRIBUTION (Figure 67): The narrow-leaflet variety is found in Eastern Africa from Mozambique north to Ethiopia-Sudan, west to approximately 28° East Longitude, with several collections from Angola. Specimens will be cited in the same sequence used for the typical variety.

#### N O R T H E R N   A F R I C A

C H A D. OUADAI: Ngatagara, 1893, Gregory s.n. (BM).

A N G L O - E G Y P T I A N   S U D A N: KORDOFAN: inter Nubium ad pagum Cordofanum Milbes, 4 Dec 1839, Kotschy 287 (HAL,MO-2 sh., mixed. non: BM,E,G,GH,K,M,MPU,NY,S,W). AS SUDD A'ALI AN NIL: Sobat, Nile, Pritchard 4 (K); near Abwang, Sobat River, 6 Jun 1929, Simpson 7075 (BM,K).

E T H I O P I A (ABYSSINIA). Chire, Petit s.n. (W); l.c., Dill & Petit s.n. (W); Aufuay, prov. Modat, 3000-4000 ft, Sep 1841, Schimper 1009 (CGE,S); ad radices montium in valle flumi Tacaze, 18 Aug 1841, Schimper 1736 (SYNTYPES: BM,G-385 & 494,GH,K-12,M 12477,W). HARAR: Mirsin Galgalo, Ogaden, 25 Nov 1945 and Wade, 28 Nov 1945, 2680 ft, Geover s.n. (G). SHO'A: Ghibbie Valley, 37°35'E-8°15'N, 1220 m, 29 Jun 1962, Mooney 9025 (K,S).

#### S O U T H E R N   A F R I C A

A N G O L A. CUANZA-NORTE: Bengo et Cuanza, Catete, 50 m, 1930, Gossweiler 9205 (K); prope Sange & Malvaceus, dist. Golungo Alto, May 1855, Welwitsch 2217 (BM). LUANDA: Bengo prope St. Antonio, Dist.

Barra do Bengo, Dec 1853, Welwitsch 2216 (TYPE synonym C. ternatea f. heterophylla Welw.: BM); ad Quicuxe, Loanda, 1854 and 1858, Welwitsch 2215<sup>1</sup> (BM-2 sh.) and 2215-2215b<sup>1</sup> (TYPE synonym C. ternatea var. stenophylla Welw.: BM. Isotypes: G,K); Ponta das Lagostas, 50 m, 14 Mar 37, Exell & Mendonca 8 (BM); Loanda, 1903, Gossweiler 161 (BM,K); Luanda, 19 Apr 1958, Monteiro, Santos, & Murta 84 (BM).

Z Ä I R E (BELGIUM CONGO). KIVU: Ruzizi valley, 14 Jul 1908, Kassner 3154 (BM). ORIENTALE: Mahagi-Poort, 600 m, 20 Sep 1951, Froment 247 (K); Kasenye, Oct 1931, Lebrum 4067 (K,NY); Parc Nat. Albert pres de Katanda, 17 Mar 1953, Fredericq & deWitte 8603 (BM); Parc Nat. Albert, Tshango, pres bac de la Semliki vers Kairinonge, 915 m, 16 Mar 1953, Fredericq & deWitte 8558 (K); Parc Nat. Albert, Kambukabakali, 950 m, Oct 1954, deWitte 11260 (K,M0); Lake Albert Edward, 25 Aug 1908, Kassner 3264 (BM).

B U R U N D I. Uzighe, Sep, Descamps 1 (Holotype of synonym C. tanganicensis Micheli: BR-11); Bujumbura, plaine de la Rusizi km 25, 850 m, 28 Sep 1966, Lewalle 1051 (K); Bujumbura, Jachere, 800 m, Oct 1967, Lewalle 2070 (K).

U G A N D A. Elephant & short grass country, Liebenberg 958 (K); Bweramuli-Kibuku Road, Dec 1925, Maitland 1129 (K). EASTERN: Agu Swamp, Teso, 3500-3550 ft, Aug 1932, Chandler 926 (K); Pingeri near Serere, 3600 ft, 20 Sep 1954, Lind 433 (K). NORTHERN: Sebei near Greek River Bailey bridge on new road to Karomoja, 3600 ft, Sep 1955, Norman 293 (K); Kangole, Karamoja, 4500 ft, Sep 1949, Tweedie 771 (K); Karamoja dist. near Kotido, Sep 1958, Wilson 614 (K). WESTERN: Butiaha plain, E shore of Lake Albert, 2300 ft, 24 Dec 1905, Bagshawe 849 (BM); W. Ankole Dist., 4000 ft, Bame 446 (K); Lake George Plains,

3200 ft, Sep 1938, Purseglove 406 (K); roadside near Lake Duamsikizi, Toro Dist., 26 Dec 1934, Taylor 2657 (BM,MO).

K E N Y A. Kiki (?), Br. East Africa, Skene 736 (G). COAST: Witu, Thomas 119 (G,K); near Changamwe, 200 ft, 14 Mar 1902, Kassner 272 (BM); Mombasa, 24-28 Apr 1927, Linder 2624 (GH); vic. Mombasa, sea level, 28 Nov 1909, Mearns 2304 (Holotype of synonym C. mearnsii DeWild: BR-10; isotype: BM); Shimba Hilla, Kwale-Mombasa Road, 500 ft, 4-5-1968, Magogo & Glover 1004 (K); Kibarani, 15 Jan 1945, Jeffery K174 (G); Lali Hills, May 1963, Perker GM519H (K); Mbololo River Drift on Voi-Manyani Park Road, Tsavo Nat. Park, Voi Dist., 1600 ft, 20 Jan 1967, Greenway & Kanuri 13074 (K); Tsavo Nat. Park, May 1965, Hucks 326 (K). NAIROBI: 16 mi E of Nairobi, 16 Jul 1951, Bogdan AB3134 (K,UC); 22 mi SE from Nairobi, 5000 ft, 24 May 1952, Bogdan VB364 (UC). NORTHERN: S Turkana at Kaputir at the banks of the river Turkwett, 2000 ft, 9 Sep 1968, Mwangangi & Gwynne 1251 (MO). SOUTHERN: Mutha Plain, Aug 1938, Boy Joana 7488 (G,K); between Makinda & Mitita Andei, 11 Jan 1950, Hale 106 (K).

T A N Z A N I A (TANGANYIKA). Observation Hill Road ca 1 mi S, Dec 1938, Vaughn 2548 (BM). EASTERN: near swimming pool University College, Dar es Salaam, 10-3-67, Harris 653 (K); Usaromo, Dae es Salaam to Bagamoyo, Kisarane Dist., 1 Sep 1926, Peter 44737 (K); Lusunguru forest, Morogoro Dist., 19 Sep 59, Mgaza 322 (K). LAKE: near Ukerewe Island, 15 Jul 1928, Conrads 13439 (K); Mwanza, Aug 1932, Rounce 205 (K); near Mwanza, 1925, Davis 54 (K,PENN,PH); Mabale Parish, Mbarika Chiefdom, Mwanza Dist., 3800 ft, 18 May 1953, Tanner 1429 (E,G,MO,NY,UC); Shinyanga, Feb 1932 and Jan 1933, Box 117 (K); l.c., 1938, Koritschoner 2115 (K). NORTHERN: Kilimanjaro,

5000 ft, 1884, Johnston s.n. (BM,K); 8 mi S of Moshi, 3 Nov 66, Beesley 53 (K); Manyara Ranch, Masai Dist., 3°35'S-35°56'E, 3700 ft, 11 Nov 64, Leippert 5291 (K,M): N side of Msasa River, Lake Manyara Nat. Park, Mbulu Dist., 2900 ft, 20 Jan 1968, Greenway & Kanuri 12055 (K); Tarangire Swamp, Mbulu Dist., 1371 m, 20 Nov 1968, Richards 23416 (K,M,NY); Yaida Valley, Endashi, Mbulu-Singida Dist., 1430 m, 19 Jan 1970, Richards 25186 (MO). SOUTHERN: Mahiwa, Lindi Dist., 150 m, 15 Dec 1955, Milne-Redhead & Taylor 7660 (K-2 sh.). TANGA: sea level, 1 Aug 1953, Drummond & Hemsley 3590 (K,S); Sawa, sea level, 21 Apr 66, Faulkner 3754 (K); Bushiri Estate, Pangani Dist., 7 Apr 1950, Faulkner 552 (K-2 sh.,S); Sima Mkwaja, Pangani, sea level, 5 Jan 57, Tanner 3362 (K-2 sh.,NY,UC); Kumbamtoni Parish, Madanga Chiefdom, Pangani Dist., 100 ft, 27 Apr 1956, Tanner 2799 (NY,S,UC); l.c., 25 Nov 1955, Tanner 2385 (NY,UC); Jasini Parish, Madanga Chiefdom, Pangani Dist., 100 ft, 10 Oct 1957, Tanner 3734 (NY,UC); Winsanbara, Mkomasi to Buiko 167 km, 530-450 m, 7 Jun 1926, Peter 41019 (K); Kilimandscharo, Tanga, Jan 1893, Volgens 26 (G-2 sh.,E,K). ZANZIBAR: 1931, Vaughn 1064 (K); Nov 1873, Hildebrandt 1189 (type of synonym C. zanzibarensis Vatke: BM,K,NY,W); Chukwani, sea level, 23 Apr 1950, Williams 24 (K).

M A L A W I (NYASALAND). Chitala R. at bridge on Chitala-Salima road, 700 m, 13 Feb 1959, Robson & Steele 1582 (BM,K). NORTHERN: Rumphi, 16 Oct 52, Hoyle 5 (BM). SOUTHERN: between Muona & Shire River, Port Herald Dist., 260 ft, 20 Mar 1960, Phipps 2566 (K,M,MO); Shire Highlands, Zambesi River, Adamson 87 (E); lower Shire Valley, Livingston Zambesi Expedition, Jan 1862, Kirk s.n. (K); Fort Johnston, 8-10-1954, Jackson 1369 (K).



Z A M B I A (NORTHERN RHODESIA). CENTRAL: Chisamba, 3-12-69,  
Mutimushi 3912 (K).

M O Z A M B I Q U E (PORTUGUESE EAST AFRICA). SUL DO SAVE:  
entre Moamba e Ressano Garcia, ca 6 km da Moamba, 17 Feb 1952, Myre &  
Carvalho 1350 (K). TETE: Msusa, Baroma, Zambesi River, 26 Jul 50,  
Chase 2815 (BM,K). ZAMBEZIA: coast of Delta, Zambesi, 8-2-61, Kirk  
s.n. (K).

31c. Clitoria ternatea L. var. pleniflora Fantz, var. nov.

Phaseolus indicus glycyrrhyzae foliis, flore amplo,  
caeruleo, pleno Comm., Hort. Med. Amstel. 1: 47,  
t. 24. 1697; nom. illeg.

Ternatea flore pleno, caeruleo Tourn., Mem. Math. Phys.  
Acad. Roy. Sci. Amsterdam 105. 1706; nom. illeg.

Clitoria foliis pinnatis L. B, Linn. Hort. Cliff. 360.  
1737; nom. illeg.

Ternatea flore pleno, caeruleo Tourn. ex Mill., Gard. Dict.  
ed. 4. 3: TERNATEA. 1754; nom. illeg.

Clitoria ternatea L. flore pleno alba Wall., Cat. Herb.  
Ind. 185 no. 5344K. 1831-32; nom. illeg.

Clitoria ternatea L. C. fl. coeruleo pleno Hasskarl, Cat.  
Hort. Bog. Alt. 275. 1844; nom. illeg.

Flowers "double," actinomorphic, (rarely 4-) 5-merous. Petals  
blue, rarely white, all similar to the vexillum of papilionaceous  
flowers. Stamens free or some filaments free with others connate  
below in 2-3 fascicles. Inflorescence typically solitary, axillary,

occasionally paired, usually bearing two flowers at the apex of the peduncle. Leaflets ovate, oval, elliptic, obovate, 1-4 cm wide, apex obtuse to emarginate, base cuneate, pubescence on upper surface strigose. Figure 71.

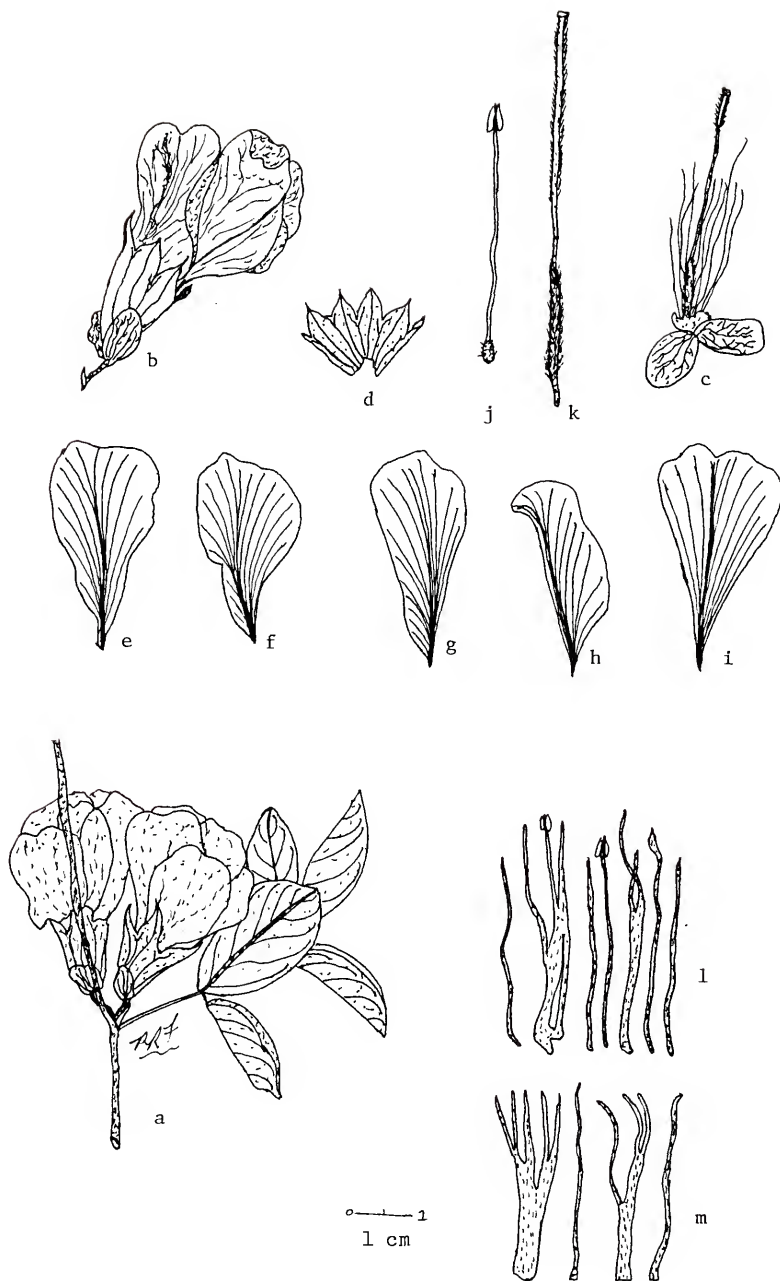
This variety is commonly found in cultivation and easily recognized by the five vexillary-like petals and paired flowers.

TYPE COLLECTION; DOMINICAN REPUBLIC. Santo Domingo: waste ground S Avenida Bolívar, vic. Ciudad Trujillo, 0-25 m, 29 Dec 1945, Allard 14400 (HOLOTYPE: S. Isotypes: GH, NY).

Double-flowered specimens of C. ternatea have been reported infrequently in the literature since Commelin (1697). Tournefort (1706) was the first to relate this group to C. ternatea, but as a separate species. Linnaeus (1737b) recognized the group as a variety of C. ternatea, a treatment Hasskarl followed in 1844. All the names published for the double-flowered member are polynomials, which in accordance with the present rules of the International Code of Botanical Nomenclature (1976), are illegitimate. The diagnostic words in these polynomial descriptions were "flore pleno." Thus the specific epithet pleniflora was selected for the varietal name.

Within the variety, there are three distinct morphological forms. One form involves a white-colored flower. The other two forms have blue flowers, but vary in the degree of connation of the stamen filaments. The earlier descriptions indicated that the flowers were blue, and the filaments were free. Therefore, a type for the variety was selected which agreed with these characteristics. Allard 14400 (S) was selected as the holotype because it had several inflorescences in full bloom, with the flowers pressed and not shriveled (as in many

Figure 71. Clitoria ternatea - IV. Var. pleniflora f. pleniflora:  
(a) node with leaf and inflorescence, x 1; (b) "double"  
flower, x 1; (c) flower with petals and calyx removed to  
observe ten free stamens, x 1; (d) calyx, x 1; (e-i)  
five vexillum-like petals, x 1; (j) individual free stamen,  
x 3; (k) gynoecium, x 2. Var. pleniflora f. subpolyadelpha:  
(l-m) ten stamens, some free, others fused in fascicles,  
x 3. (Allard 14400, S: a-k. Dossett s.n., WIS: l.  
Zimmermann 5, U 041879: m.)



collections), and a dissected flower (Figure 71, a-k) which illustrates the diagnostic characteristics.

Many of the double flowers are glued to the herbarium sheet, making it difficult to observe the filament bases. Often the calyx will be somewhat split near the base. One can easily observe the stamen base by enlarging this opening with a probe to observe if connation has occurred. Free filaments indicate the typical form. If some of the filaments are connate, it indicates f. subpolyadelpa. Likewise, in shriveled flowers, diadelphous stamens and four thin claws indicate a papilionaceous flower, whereas some free filaments and five broad, cuneate, petaled claws indicate the double flower.

DISTRIBUTION (Figures 65, 66, and 72): Double-flowered members are distributed in widely scattered areas of the neotropics and Southeast Asia and Indonesia. They occur frequently in cultivation, but can grow spontaneously and maintain small populations. This variety is conspicuously absent in Africa where the majority of specimens of C. ternatea were collected. This variety is also absent in Australia and the Pacific Islands, where the species has been introduced. The origin of the variety is unknown, but earlier literature references (Commelin, 1697; Tournefort, 1706) indicate that double-flowered individuals were sent from the East Indies to Europe for cultivation, where the plant typically did not produce seed. The present distribution was probably the result of man originally following the sea trade routes, and using the plant for a cultivar.

3lca. Clitoria ternatea L. var. pleniflora Fantz f. pleniflora

Flowers blue. Stamens ten, filaments all free.

DISTRIBUTION (Figures 65, 66, and 72): The typical form is scattered in the neotropics, Southeast Asia, and Indonesia, commonly as a cultivar. The specimens are cited in a sequence similar to C. ternatea var. ternatea.

#### N O R T H   A M E R I C A

U N I T E D   S T A T E S. FLORIDA: Avon Park, 9 Sep 1931, McFarlin 5705 (MICH); l.c., Aug 27, 1934, McFarlin 8996 (FLAS).

#### W E S T   I N D I E S

C U B A. SANTA CLARA: Lomos de Banao, May 1920, Luna 562 (NY).

H A I T I. Massif de la Pelle Petionville, 27 Nov 1927, Ekman 9364 (S); along road to Aquin 0.5 mi from Miragoane, 17 Sep 1927, Eyerdam 542 (GH,NY).

D O M I N I C A N   R E P U B L I C. SANTO DOMINGO: vic. Ciudad Trujillo, waste ground E of Allard's house 1 mi W of center of city, 9 Nov 1945, Allard 13206 (G,U) and 22 Nov, 13544 (F) and 1 Dec, 13757 (G-2 sh.,MO).

P U E R T O   R I C O. BARCELONETA: Montebello, 1930, Boubee s.n. (P); cult. & spontaneous l.c., 7 Dec 1939, Stehlé 269 (NY).

S T.   B I N N. cult. Gustavia, Jun 1938, Questral 329 (NY).  
ST. MARTIN: cult. Philipsburg, 19 Jan 1965, Arnoldo 3424 (U).

M A R T I N I Q U E. Duss 1073 (NY).

S O U T H   A M E R I C A

E C U A D O R. GUYAS: Guayaquil, 1852, Andersson s.n. (S).

MANABI: entre Salina y Chone, 10-400 m, 26 Jul 1945, Solis 10602 (F).

C O L O M B I A. SANTANDER: along RR between Las Bocas & Las Palmas, 14 Jun 1953, Langenheim 3006 (UC).

V E N E Z U E L A. Elias 270 (F). MIRANDA: cult. Caracas, Jul 1941, Elias 481 (F). MONAGAS: cult. Santa Barbara, 2 Nov 1948, Maguire, Kunhardt Jr., & Politi s.n. (NY).

B R A Z I L. PARÁ: Belém, 5 Aug 1954, Ciuffi 74 (UC).

S O U T H E R N   A F R I C A

M A U R I T I U S: N.T.H. 119 (S).

A S I A

I N D I A. ASSAM: Tamlu, May 1895, reporter on Econ. Prod. to Gov. India, Anonymous 11862 (M).

T H A I L A N D (SIAM). CENTRAL: Bangkok, 1899, Zimmermann 5 (BM,G-2 sh.,PR. non: M,U-mixed,W).

M A L A Y A. cult. Bot. Gardens, Singapore, 18 Jun 1929, Nur s.n. (NY).

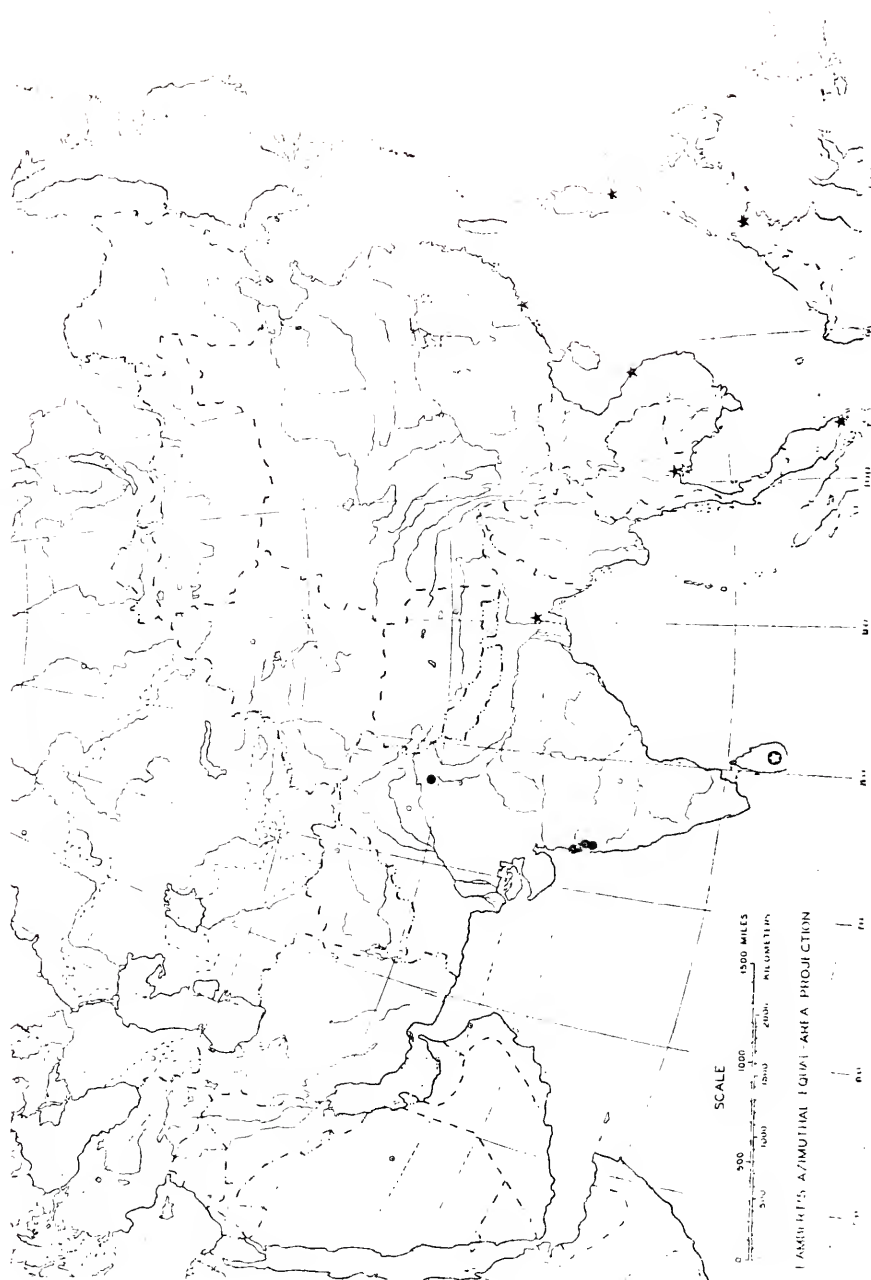
V I E T N A M. ANNAM: cult. Hue & vic., May-Jul 1927, Clemens & Clemens 3678 (BM,NY,U,UC).

C H I N A. HONG KONG: Chung Chi Campus, Shatin, N/T, 20 Oct 1968, Hu 6013 (K).

P H I L I P P I N E S. LUZON: Manilla, Oct 1914, Blanco 394 (A,BM,F,MO,W-mixed; non: GH,NY); Manille, 1919, Perrottet s.n. (G).

Figure 72. Asian distribution of two species of subgenus *Clitoria*.  
*Clitoria biflora* (●); *C. ternatea* var. *pleniflora* f.  
*pleniflora* (★), f. *subpolyadelpa* (⊛).





B O R N E O. BRITISH NORTH BORNEO: Sandakan & vic., Feb-Mar, 1920, Wood 776 (UC).

S U M A T R A. EAST COAST: vic of Hesa, Asahan, Boeea 8433 (NY).

J A V A. Batavia, 1835, Delessert s.n. (G-2 sh.): Basae Roesak-cult., 27 Feb 1958, Amand s.n. (U).

3lcb. Clitoria ternatea L. var. pleniflora Fantz f. leucopetala Fantz, f. nov.

Clitoria ternatea L. flore pleno alba Wall., Cat. Herb.

Ind. 185 no. 5344 K. 1831-32; nom. illeg.

Flowers white. Stamens ten, filaments all free.

TYPE COLLECTION: CUBA. Las Villas: near Guabiro on road to Manicaragua, 13 Oct 1941, Gonzales 273 (HOLOTYPE: NY. Isotype: A).

NOTES: Groff 5941 reported the flower color as yellow, a color unknown in C. ternatea. The flowers were all shriveled, similar to those present in the isotype. A number of white-flowered specimens of C. ternatea are pale yellowish in the dried state. It is assumed that Groff noted the color in post-matured flowers, and that the flowers were white when mature.

Wallich reported white-doubled flowers in his catalogue of Calcutta cultivars. This author has not examined any specimens from his collection with the number 5344K.

DISTRIBUTION (Figures 65 and 72): The white doubled-flowered form is rare and known only in cultivation outside the type locality.

T H A I L A N D (SIAM). CENTRAL: cult. Bangkok, 1-29 Jun 1920, Groff 5941 (F,GH,NY,PH,UC).

3lcc. Clitoria ternatea L. var. pleniflora Fantz f.

subpolyadelpha Fantz, f. nov.

Flowers blue. Stamens ten, some filaments free with others connate below in 2-3 bundles of 2-6 stamens each.

TYPE COLLECTION: CUBA. Dossett s.n. (HOLOTYPE: WIS).

The connation of some of the filaments in this form represents an intermediate state between the typical double flower with ten free stamens, and the typical papilionaceous flower with nine connate stamens and one free vexillary stamen. In this form, the stamens do not completely revert from the diadelphous state to the primitive free state. In the specimens examined, there was always a minimum of two free stamens and two or three bundles of connate stamens. Typical combinations included: 3 connate + 2 connate + 5 free (type); 3 connate + 2 connate + 2 connate + 3 free; 5 connate + 3 connate + 2 free.

The specimen deposited at the University of Wisconsin Herbarium was selected as the holotype because it was the specimen in which the connate filaments were noted. The specimen includes a dissected flower. Other collections were noted a few months later when every double flower specimen was examined before annotation for the stamen pattern. Since the stamens were in several groups formed by the union of the filaments (polyadelphous), but had some free stamens, the name subpolyadelpha was used for this form.

DISTRIBUTION (Figures 69 and 72): This form is uncommon, known from two localities in the West Indies (Florida and Cuba), and a few localities in Southeast Asia and Indonesia, all probable cultivars.

UNITED STATES. FLORIDA: Southern Florida, cult., seeds from Key West, 1850, Findley s.n. (NY).

SRI LANKA (CEYLON). cult. N of Carney up Adam's Peak Trail, Ratnapura Dist., 27 Jun 1972, Maxwell, Hepper, & Fernando 952 (K,MO).

THAILAND (SIAM). Bangkok, 1899, Zimmermann 5 (U-mixed. non: BM,G,M,PR,W).

SUMATRA. Korthals s.n. (S).

FIIJI. Suva, Vitu Levu, Jul 1927, Wall 383 (S).

32. Clitoria heterophylla Lam., Ency. 2: 51. 1786.

Nauchea heterophylla Desc., Mem. Soc. Linn. Pap. 4: 8. 1826.

Clitoria pedunculata Boj. ex Benth., Ann. Wein. Mus. 2: 114. 1837; non Micheli (1875).

Ternatea heterophylla (Lam.) Kuntze, Riv. Gen. Pl. 1: 210. 1891.

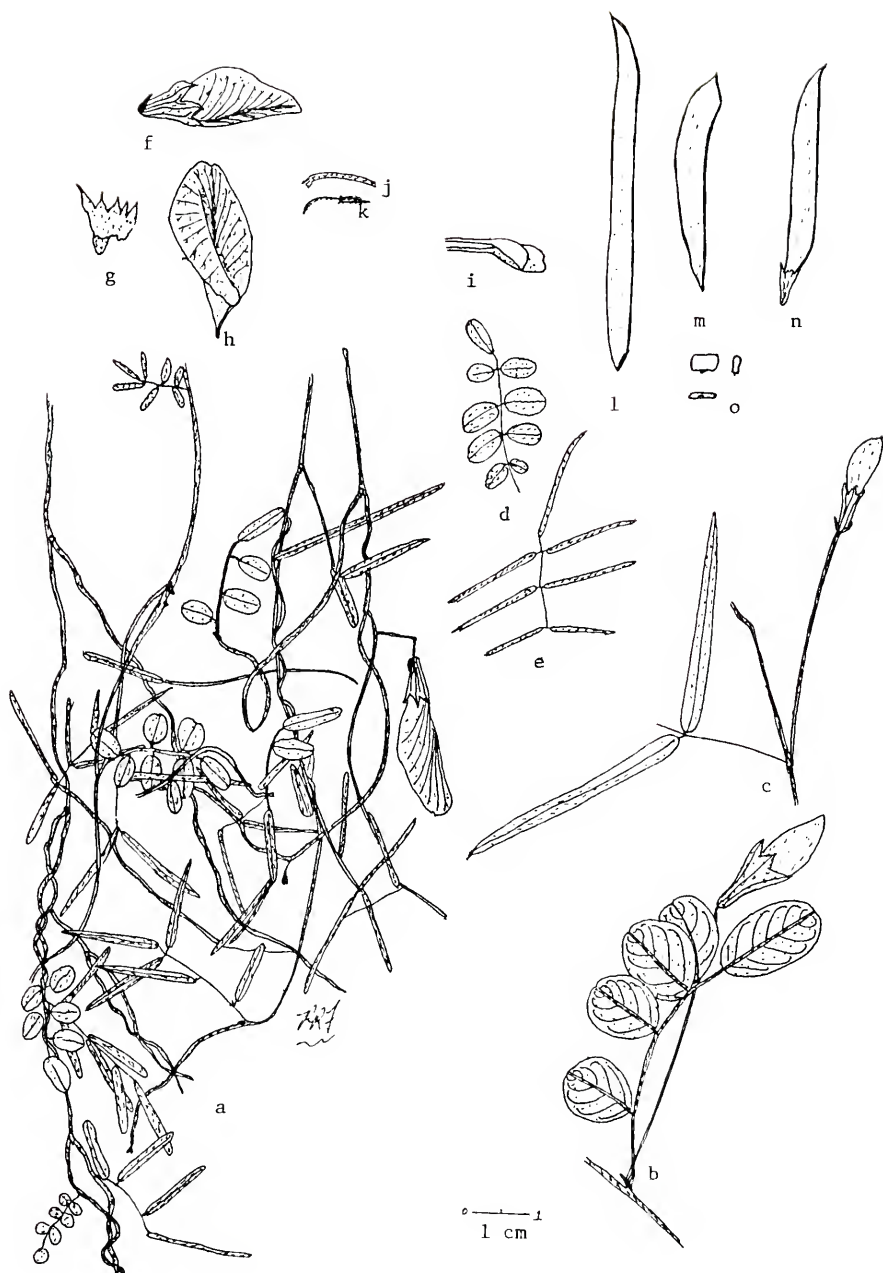
Ternatea pedunculata (Boj. ex Benth.) Kuntze, l.c.

Perennial herbaceous vine, base suffrutescent, sprawling to climbing, forming tangled mats, to 2 m long. Stems filiform, 0.3-0.7 mm diameter, twining, subquadrangular becoming terete, pith minutely hollow, juvenile stem pubescence dense, soon becoming scattered, trichomes short, 0.2-0.4 mm long, whitish, subappressed or occasionally erect. Leaves odd-pinnate, somewhat concolorous, (3-) 5-, 7-, 9- (11-) foliate; leaflets heterophyllous with two basic morphological forms, stems bearing both leaflet forms or bearing only one form;

leaflet type I oval to suborbicular, elliptic to lanceolate-elliptic, apex obtuse, mucronate, occasionally retuse, base rotund, primary nerves inconspicuous, of 4-6 pair, lamina 0.5-2 cm long, 0.4-1.1 (1.5) cm wide; leaflet type II narrowly linear, spatulate-linear, to narrowly oblong, apex obtuse, mucronate, base broadly cuneate to rotund, primary nerves of 7-10 pair, lamina 1-4 cm long, 0.1-0.4 (0.8) cm wide with broader leaflets typically 1-2 cm long; occasionally type I leaflets are found as lower pair on type II leaf, or occasionally type II leaflets are found terminally on type I leaflet; leaflet pubescence uncinata above becoming glabrate with trichomes confined to midrib, lower surface moderately pubescent becoming glabrate, trichomes short, 0.2-0.4 mm, erect to appressed. Petioles caniculate, 0.2-2.0 cm, shorter than the rachis (1-2 cm long when bearing only 3 leaflets), sparsely pubescent or occasionally moderate; rachis (0.8) 1.1-1.5 cm, internode segments variable, 0.3-1 cm, terminal segment shortest; combined petiole and rachis (1) 1.5-3.5 cm. Petiolules subquadrate, 0.7-1 mm, pubescence moderate, appressed to spreading. Stipules narrow linear, tapered gradually to a point, 1-nerved, 1-3 mm long, 0.1-0.4 mm wide; stipels caducous, stipule-like, 1 mm long, 0.1 mm wide. Inflorescence axillary, solitary, 1- (2-) flowered; peduncle short, 0.3-1 cm, or elongate and arcuate, (1.5) 2.5-7 cm, bearing chasmogamous flower(s) at apex, glabrate with few scattered, short trichomes. Pedicels 2-4 mm long, uncinata pubescent. Bracts reduced to middle pair, stipule-like, 1-2 mm long, 0.2-0.4 mm wide, outer and inner pair caducous (?), not observed. Bracteoles minute, linear-lanceolate, acute to apiculate, 3-nerved, middle nerve most conspicuous of the three, membranaceous, translucent, deciduous,

2-3 mm long, 0.4-1 mm wide, pubescence uncinata with short macroscopic trichomes, ciliolate. Flowers very small, (2) 2.5-3 cm, blue. Calyx minute, membranaceous, translucent, shrinking in fruit, pubescence uncinata with occasional scattered, short trichomes, tube 10-nerved, five nerves extending into lobe to apex, five nerves (less prominent) extending to sinus, becoming somewhat impressed near sinus, tube 4-7 mm long, 2-3 mm wide at base to 3-4 mm wide at throat, lobes deltoid, acuminate, 1-nerved prominently raised, length 2-3 mm, width 1.5-2 mm near base, ventral lobe 3-4 mm. Vexillum glabrate outside, 1 cm wide, claw 1-3 mm long. Alae obovate, extended beyond carina 2-3 mm, blade 8-11 mm long, 5-6 mm wide, claw 7-9 mm. Carina subfalcate, 5-7 mm long, 2-3 mm wide, claw 10-12 mm. Stamens diadelphous, tube 8-10 mm long, free filaments 3-5 mm; anthers elliptic, 0.7-1.0 mm long, 0.5-0.8 mm wide. Gynophore 1-1.5 mm, dark-colored with sparse uncinata pubescence; ovary 5-6 mm long, 0.7-0.9 mm wide; pubescence dense, white, appressed-spreading, dark-colored beneath the trichomes; style 7-10 mm, weakly geniculate 4-5 mm from distal end, densely white-bearded below stigma; stigma capitate, 0.8 mm diameter. Legume sessile, flat, weakly raised around seeds, tan, 2-4 (6) cm long, 4-5 mm wide, pubescence inconspicuous, trichomes white, 0.2-0.5 mm long; stipe enclosed within calyx along with legume base, 1.5-2 mm long; beak when present 2-4 mm long; dehiscence causing valve to twist 1.5-2 turns. Seeds black, oblong-subreniform, surface minutely pitted, compressed, 1 mm thick except near center (ca 2 mm thick), 2-3 mm long, 3-5 mm wide, 4-7 (9) seeds per pod; hilum 1 x 1.5 mm. Figure 73.

Figure 73. Clitoria heterophylla. Var. heterophylla: (a) portion of habit, x 1; (d) type I leaf, x 1; (e) type II leaf, x 1; (g) calyx, x 1; (h) vexillum, x 1; (i) ala and carina, x 1; (j) androecium, x 1; (k) gynoecium, x 1; (n) legume, x 1. Var. pedunculata: (b) node with type I leaf and inflorescence, x 1; (c) node with type II leaf and inflorescence, x 1; (f) flower, x 1; (l-m) legumes, x 1; (o) three views of seed, x 1. (Bojer v.75, CGE-hb. Lemann: a,n. Commerson s.n., G-181: d-e,g-k. Afzelius s.n., S: b,f. Bojer v.77, W: c,m. Richard 056, K-369: l,o.)





Heterophyllous Clitoria is characterized as an herbaceous vine with two leaf types and minute leaflets, and bearing very small, blue flowers having a small calyx and bracteoles. Clitoria heterophylla is easily recognized because of the minute leaflet size, but may be confused with some individuals of C. ternatea var. angustifolia which also exhibit a small, elongated leaflet size and small flowers. Clitoria ternatea var. angustifolia lacks 9- and 11-foliate leaves, leaflets are broader (4-12 mm wide), stipules are longer (4-7 mm), bracts and bracteoles are longer (2-4 mm and 4-7 mm respectively), flowers are white or white with thin peripheral edge of blue and 3-4 cm long, calyx lobes are elongate (7-10 mm), the staminal tube is longer (16-20 mm), and the fruit is larger (7-11 cm x 8-11 mm).

PHENOLOGY: Collectors of specimens of C. heterophylla rarely gave any data except locality information. From only a few collections, this species bears flowers and fruits from March to June. One collection made in October had fruits.

TYPE COLLECTION: Indes orientales, M. Sonnerat s.n. (HOLOTYPE: P-LA, not seen).

Lamarck described the species from a specimen sent to him by Sonnerat. The species is unique in the genus Clitoria by having two distinct leaf types present on a stem. Lamarck's description and specific epithet clearly mark this species, even though the type has not been seen. Lamarck reported the locality as "Indes orientales," although the species is an endemic of Madagascar and Mauritius. This species is known to be cultivated in India (Calcutta) and portions of the East Indies. Sonnerat's specimen is presumed to have been collected from a cultivar.

Bentham's C. pedunculata has always been treated as a segregate species from C. heterophylla. There is little difference between the two except for the peduncle length, the length of the legume, and the pubescence on the calyx and leaflets. These differences do not warrant retention as separate species. Therefore, C. pedunculata has been reduced to varietal status.

VERNACULAR NAMES: MADAGASCAR: Kilelo, Richards 056.

ECONOMIC IMPORTANCE: Clitoria heterophylla is a desirable cultivar for its heteromorphic leaves, climbing and intertwining habit, and small, deep blue flowers.

NOTES: Although this species is noted for its two distinct leaf types appearing together on the same stem, a stem may bear only one of the two leaf types about as commonly as those stems bearing both leaf types. When both are borne, there is no distinct pattern present in the arrangement of the leaf types.

DISTRIBUTION (Figure 62): This species is endemic to the islands of Madagascar and Mauritius, although cultivated specimens are grown in India, Java, and a few other scattered areas in the tropics. The species is found natively on sandy soil in open areas of dry mountain slopes, in mountain ravines, fields, and forest edges growing over low shrubs and the herb layer. Richards 056 reported the species from an Euphorbia forest. The only altitude reported was 100 m.

#### KEY TO VARIETIES:

1. Peduncles 3-10 (occasionally 20) mm; pedicel solitary medially from peduncle apex; legume 2-3.7 cm, trichomes short, appressed; calyx pubescence uncinata; leaflet width of elongated form narrow,

1-4 mm wide; leaflet pubescence uncinata above (becoming glabrate).

(Mauritius & Madagascar) . . . . . 32a. var. heterophylla

1. Peduncles (15) 25-70 mm; pedicel solitary, often laterally borne from peduncle apex, or occasionally paired; calyx pubescence uncinata with scattered, subappressed trichomes; legume 3.5-6 cm, trichomes short, erect to subappressed; leaflet width of elongated form broad, 3-8 mm wide; leaflet pubescence uncinata above with short, appressed trichomes, becoming glabrate.

(Madagascar) . . . . . 32b. var. pedunculata

32a. Clitoria heterophylla Lam. var. heterophylla

Elongate leaflets narrow, 1-4 mm wide; leaflet pubescence on upper surface uncinata; 3-foliate leaves rare. Peduncle short, 3-10 mm long; pedicels solitary borne medially from peduncle apex. Legume short, 2-3.7 cm, pubescence appressed.

DISTRIBUTION (Figure 62): An endemic of Mauritius and Madagascar Islands, cultivated elsewhere.

L O C A L I T Y    U N K N O W N. M.M. s.n. (MPU-36); 1833, Poppe 74 (S); cult. hort. Borg., 12 May 1893, Hallier s.n. (G); l.c., Teysmann s.n. (K); Indies, hb. Ventenat, Riches s.n. (G); Ind. ore., Anonymous s.n. (S); l.c., hb. Ventenat s.n. (G); l.c., hb. Schweinitz s.n. (PH).

M A D A G A S C A R. Anonymous s.n. (U 038634); Be'vooy, Mar, Elliot 2777 (E); Fort Dauphin, Jul 1890, Elliot 3035 (BM,E,K); mts. of Androy, Roussel 31 (K-mixed).

MAURITIUS (ISLE DE FRANCE). N.T.H. s.n. (S-2 sh.); Anonymous s.n. (MPU-6); 1787, Banck s.n. (MPU); 1878-79, Belanger s.n. (G); 1846-48, Boivin s.n. (W); Mar 1830, Bojer 75 (BM, CGE, K, MO, W); Bouton s.n. (CGE-2 sh.); Commerson s.n. (BM, G); Hardwiche 34 (BM, G); hb. Lambert s.n. (CGE); hb. Lemann s.n. (CGE); Martin 576 (G); Maynard s.n. (W); Sieber s.n. (NY); Sieber 150 (NY, PR); Sieber 151 (G-2 sh., HAL, K-2 sh., M, MO, NY, US, W-3 sh.); Sieber 191 (HAL, M, MO, PR); Telfair s.n. (K, NY-2 sh.); Ventenat s.n. (G); Pailles, Pampleonousses and Port Louis, Bouton s.n. (K); Pamplénouse, Cunningham 370 (BM, K); Port Louis, Gardner s.n. (K).

INDIA. WEST BENGAL: hort. bot. Calcutta, Jun 1815, Wallich 767 (BM).

SRI LANKA (CEYLON). cult., Anonymous s.n. (MPU-8).

JAVA. Buitenzong, Apr 1921, Arrhenius s.n. (S).

UNITED STATES. FLORIDA: Dade Co.: cult. Chapman Field, 23 May 1930, Walsingham 65298 (US).

BRAZIL. 1814-17, Bowie & Cunningham s.n. (BM).

32b. Clitoria heterophylla Lam. var. pedunculata (Bojer ex Benth.) Fantz, comb. nov.

Clitoria pedunculata Bojer ex Benth., Ann. Wein. Mus.

2: 114. 1837; non Micheli (1875).

Ternatea pedunculata (Bojer ex Benth.) Kuntze, Riv. Gen.

Pl. 1: 210. 1891.

Elongate leaflets broad, 3-8 mm wide; leaflet pubescence on upper surface uncinat with scattered, short (0.2-0.5), subappressed

trichomes; 3-foliate leaves infrequent. Peduncle elongate, arcuate, (15) 25-70 mm long; pedicel commonly solitary, borne laterally from peduncle apex, or occasionally pedicels paired at peduncle apex, both borne laterally. Legume long, 3.5-6.0 cm, pubescence erect to subappressed.

This variety is easily recognized by the elongate peduncles bearing the flower from the lateral side of its apex.

TYPE COLLECTION: MADAGASCAR: inter frutices ad margines fluviorum, Mar 1830, Bojer v.77 (LECTOTYPE: W).

When Bentham published Bojer's name in 1837, no collection was cited. In 1858, Bentham cited one collection as "Bojer (herbaria Musaei Vindobensis)." The descriptions published by Bentham consistently noted 3-foliate leaves, an uncommon leaflet number in the species. Bojer v.77 (W) bears the identification "Clitoria pedunculata mihi" and has only 3-foliate leaves. Even though Bentham neglected to cite a type specimen in 1837, his description (which agrees with Bojer v.77) and reference in 1858 to a Bojer collection at Wein, indicate that Bojer v.77 (W) is the probable type, thus it is designated the lectotype.

The type specimen is typical in peduncle length and fruit size and pubescence, but is atypical in bearing only 3-foliate leaves. Leaves more commonly have 5-, 7-, and 9-leaflets.

DISTRIBUTION (Figure 62): This variety is endemic to Madagascar with one collection from Mauritius.

M A D A G A S C A R: 1880, Cowan s.n. (BM); Baron 4615 (K); Cent. Madag., Baron 4586 (BM,K); Betsileo land, Baron 270 (K); Majunga, 17 Apr 1912, Kaudern s.n. (S-2 sh.); Hazafolsy Reserve II,

10-1-1971, Richard 056 (K-mixed). TULEAR: Manasoa Tanosy, 11-1-1913, Afzelius s.n. (S-2 sh.); Manamby (Morondava-Tananarive), 20°25'S-44°50'E, 100 m, 17 Mar 1971, Mabberley 731 (K).

M A U R I T I U S. Possensika (?) 1352 (W).

33. Clitoria biflora Dalzell in Hook. Kew Journ. 2: 35. 1850.

Ternatea biflora (Dalz.) Kuntze, Riv. Gen. Pl. 1: 210.

1891.

Subshrub (woody herb), erect, sparsely branched to unbranched, to 70 cm tall, conspicuously pubescent, trichomes somewhat stiff, typically ca 1-1.2 mm long, subappressed to suberect, base geniculate. Stems weakly flexuous, lignose, 2-4 mm diameter; juvenile stem pubescence dense, becoming moderate with age, trichomes tending to form longitudinal lines below. Roots fibrous, to 3 mm thick, major branches 5-10 cm long. Leaves odd-pinnate, 5-foliate with the lowest lateral pair near the stem and a conspicuously long rachis internode separating the upper lateral pair which is near the terminal leaflet, the lower lateral pair often deciduous first giving the false impression of a 3-foliate leaf; leaflets concolorous, polymorphic, typically lanceolate, linear-lanceolate, to ovate-lanceolate to ovate, or less commonly oval to subcordiform to suborbicular, or oblong, apex commonly tapered to acute point, mucronate, and base broadly cuneate, or apex more or less obtuse and abruptly short-acuminate, with acumen 1-3 mm or retuse, and base rotund to retuse, midrib raised above and conspicuously pubescent, primary nerves of 7-9 pair, upper surface pubescence scattered to glabrate, trichomes subappressed, 1 mm long,

lower surface pubescence moderate to scattered, with subappressed to suberect trichomes, 1-1.2 mm long, lamina 3-9 (12) cm long, 1.5-3 (4) cm wide (0.5-1 cm wide in linear-lanceolate leaves); lower lateral pair of leaflets smallest, upper lateral pair subequalling to slightly smaller than terminal leaflet. Petioles caniculate, much shorter than the rachis, 0.5-1 (1.5) cm long, subhispid pubescent; rachis 3-7 cm with conspicuously long internode between lateral leaflets of 2-4 (5) cm, terminal internode ca twice petiole length, 1-2 cm; combined petiole and rachis 3.5-7 (7.5) cm. Petiolules 2-3 mm, subhispid. Stipules linear to setaceous, 3-nerved from base to near middle with midrib persisting to apex, upper portion nearly awn-like, ciliate, 6-11 (16) mm long, 0.3-0.8 mm wide; stipels setaceous, 3-7 (9) mm long, 0.1-0.3 mm wide. Inflorescence axillary, solitary, biflowered, usually reflexed, ca 0.5 cm long; peduncles 2-3 mm, sparse-pubescent; pedicels paired, borne laterally at peduncle apex, 2-4 mm. Bracts linear to setaceous; inner bracts not observed; middle bracts conspicuous, 4-6 mm long, 0.4-1 mm wide; outer bract 2-4 (6) mm long, 0.4-0.7 mm wide. Bracteoles oblong to ovate, 5-nerved, middle nerve excurrent by 2-4 mm, membranaceous, translucent, 6-11 mm long, (2) 3-4 (5) mm wide, pubescence scattered, subhispid, trichomes along nerves. Flowers small, 2.5-3.5 cm long, blue. Calyx membranaceous, translucent, 10-nerved, nerves prominently raised, five nerves extending to sinus, five nerves extending to lobe apices, pubescence uncinata and with scattered, 1 mm long, somewhat stiff, spreading trichomes, tube 5-8 mm long, shrinking to 4-6 mm in fruit, 2-3 mm wide at base expanding to 4-5 mm wide at the throat, lobes ovate, excurrent, awn thinly decurrent, ca one-third to one-half the lobe length, lobe 4-8 mm long,

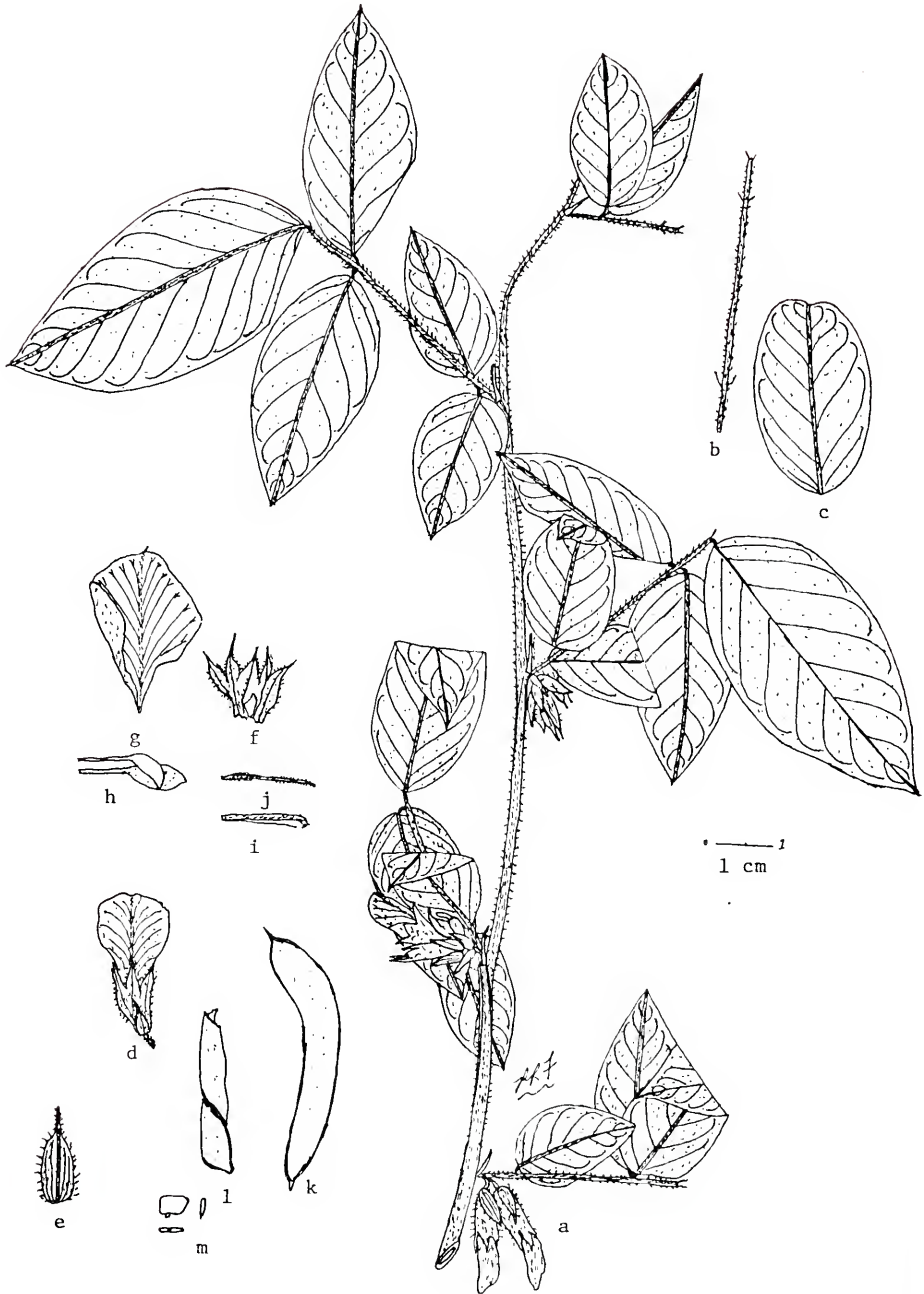
2-3 mm wide, ventral lobe subequalling others. Vexillum glabrous outside, 1.5 cm wide, claw ca 2 mm. Alae extended beyond carina 3-4 mm, blade 9-11 mm long, 3-4 mm wide, claw 9-10 mm. Carina oblique, nearly oblong, 5-7 mm long, 2-2.5 mm wide, claw 12-14 mm. Staminal tube 10-11 mm, free filaments 2-4 mm; anthers elliptic, ca 0.7 mm long, 0.5 mm wide. Gynophore 1 mm, dark-colored; ovary 5 mm long, 0.8-1 mm wide, pubescence dense-sericeous, whitish trichomes 1 mm long; style 11-12 mm long, geniculate ca 2 mm from distal end, base sericeous, expanded above, densely bearded. Legume subsessile, flat, very weakly depressed between seeds, subfalcate near apex, light brown, sutures thickened, (2.5) 3-5 cm long, 6-8 mm wide, pubescence uncinata with suberect, ca 1 mm long trichomes; beak 2-5 mm, subhispid-pubescent; stipe ca 2 mm, enclosed with base of legume within persistent calyx; dehiscence causing valve to twist 1-1.5 (2) turns. Seeds black, oblong, compressed, 0.5-1 mm thick, thickest near middle, 3-4 mm long, 4-6 mm wide, 2-4 seeds per pod; hilum 1 x 1.5 mm. Figure 74.

Dalzell's Clitoria is characterized as a subhispid woody herb with five leaflets, the lowest pair conspicuously separated from the other, and inflorescences bearing two small blue flowers on short peduncles from the leaf axils.

PHEONOLOGY: Collectors rarely noted the dates on which the specimens were collected; however, from the available data it appears flowers are borne from August to September and fruits are borne from mid September through October.



Figure 74. Clitoria biflora. (a) habit, x 1; (b) petiole and rachis with stipels, x 1; (c) leaflet, x 1; (d) flower, x 1; (e) bracteole, x 2; (f) calyx, x 1; (g) vexillum, x 1; (h) ala and carina, x 1; (i) androecium, x 1; (j) gynoecium, x 1; (k-l) legumes, x 1; (m) three views of seed, x 1. (Law s.n., K-74, hb. Hooker: a,e-i. Getune s.n., K-71, hb. Hooker: b-d,k. Sedwick & Bell 5782, K-69: l-m.)



TYPE COLLECTION: INDIA. Bombay, hb. Dalzell s.n. (LECTOTYPE: K-5, hb. Dalzell. Isolectotype: K-4, hb. Hooker). "An erect sp. mihi in Hook., hb. Dalzell 1694 (LECTOPARATYPE: GH).

Dalzell did not indicate any type collection in his publication of the species's name and description. In 1858, Bentham cited three collections: Dalzell, Law, and Stocks. The Dalzell collection(s) was the probable type collection of these three. There are three Dalzell specimens, two now deposited at Kew in type folders, one deposited at the Gray Herbarium. One of the Kew specimens was originally deposited in Hooker's herbarium, and came from Dalzell's herbarium of Bombay plants. This specimen has flowers and tends to agree with the original description. A second Kew specimen was added in 1878 when Mrs. Dalzell presented N. A. Dalzell's herbarium to Kew. This specimen has flowers and more closely matches the description. The Gray Herbarium specimen came from the Dalzell herbarium and bears the number 1694. This specimen's label appears to have been written in a different ink. The specimen has a different aspect to it, a subjective judgement of this author, indicating that this specimen was collected at a different time (probably a later date since fruits are present) or from a different population, thus it is not a duplicate of the Kew specimens. The Gray Herbarium specimen was not selected as the lectotype because the original description lacked a description of the fruits. But Dalzell noted his new name on the sheet ("Clitoria biflora, an erect sp. mihi in Hook.") and added it to the herbarium. As the only specimen examined by the original author (i.e. Dalzell) that has fruits, the Gray Herbarium specimen was designated as a lectoparatype. The Kew specimens closely agree with the original

description, and are considered the type collection. The specimen retained by Dalzell in his herbarium (and later added to Kew by relatives) was considered the more probable type, and designated as the lectotype. The specimen Dalzell selected for deposit in the Hooker herbarium was considered a duplicate of the type, and thus designated as an isolectotype.

NOTES: Clitoria biflora has been confused occasionally with 5-foliolate specimens of C. ternatea from India. Clitoria biflora can be distinguished easily by its erect habit, conspicuous subhispid pubescence, the lower lateral pair of leaflets widely separated from the upper pair, the shorter and narrower fruits, and shorter inflorescence which typically bear paired flowers.

The locality of "Concan" was frequently cited by early collectors. Dalzell & Gibson (1861) in their "Bombay Flora" reported two localities of C. biflora, Concan and Ft. Sewnee. Rolla S. Rao (CAL) indicated (personal correspondence) that Concan was a geographical region in Western India extending from Bombay to Goa, between the Western Ghats and the Arabian Sea Coast, and that Ft. Sewnee was ca 30 mi from Poona. The Gibson s.n. collection (CAL) was not examined (data: Road to Baleswar), and may be the source of the Ft. Sewnee locality near Mahabaleswar.

DISTRIBUTION (Figure 72): This species is an endemic in Western India. Habitat data are rarely noted. Sinclair 4434 reported the specimen collected from a wooded stream bank. Blatter 5782 noted that rainfall was 60 inches. The only altitude reported was 4500 ft.

I N D I A. MAHARASHTRA: Bombay, Getune s.n. (K); l.c., Law s.n. (K); l.c., 1835, Roux s.n. (G-2 sh., mixed); Bassein, Asia, Hugel 1665

(W-2 sh.); Concan, Stocks s.n. (BM, CGE-2 sh.-mixed, G, GH, K-3 sh., M 15344, S, US, W; non M 12417); Sinhagad, Haveli taluka, Poona dist., 10-9-1964, Ansari 101544 (MO); W. Abu, Rajputana, 4500 ft, Oct 1916, Blatter 5782 (K); near Matheran, 2 Sep 1890, Kanetkar s.n. (E); Amboli near Jogeshwari, 16 Sep 1945, Sinclair 4434 (E). HIMACHAL PRADESH: Simla, 20 Oct 49, Thompson s.n. (K). UTTER PRADESH: Chandbagh Exp. Sta., Dehra Dun, cult. local seed, 29 Oct 23, Gupta 191 (K).

34. Clitoria kaessneri Harms, Engl. Jahrb. 49: 440. 1913.

Suffrutescent perennial herb, trailing to erect, to 60 cm tall. Stems subquadrangular above to weakly terete below, longitudinally striate-caniculate, nearly straight to weakly arcuate below, often weak to strongly flexuous above, 3-6 mm thick, arising from one end of a subterranean xylopodium, pith hollow, pubescence uncinata and short pilose, internodes 2.5-8 cm; branches few, confined to near the base. Xylopodium rarely collected, subterranean, lignose, usually unbranched, dark-colored, 7-15 cm long plus the uncollected portion that was absent, 5-11 mm wide; bark longitudinally striated. Roots few, filiform, arising near xylopodium apex, 1-3 cm long, 1-2 mm thick, bearing sparse branches 5-9 mm long. Leaves yellowish-green to straw-colored on both sides, 1- and 3-foliate (1-foliate leaf less common), chartaceous to subcoriaceous; leaflets with midrib raised above, primary nerves of 7-10 pair with secondary nerves prominently raised on both surfaces, pubescence uncinata above along midrib, uncinata and pilose pubescence below on major nerves, leaflets

variable in form; 3-foliate leaves short-petiolate, leaflets oblong, oblong-lanceolate, obovate to oval, apex acute to obtuse, usually short-mucronate, rarely truncate, base cuneate to rotund, lateral leaflets ca one-half to two-thirds the size of terminal leaflet, lamina 2-6 (8) cm long, 1-3 (4) cm wide; petiole caniculate-striate, 0.5-1.6 (2.2) cm, pubescence uncinata and short-pilose; rachis similar to petiole, 0.4-1.1 cm; 1-foliate leaves sessile, oblong, oblong-lanceolate, to elliptic, 4.5-10 cm long, 2-5 cm wide, commonly borne at upper nodes above 3-foliate leaves, or occasionally only 1-foliate leaves borne on the stem. Petiolules subquadrata, pubescent, (2) 3-4 mm. Stipules persistent, lanceolate, acuminate, 5-nerved with prominent midnerve, 5-9 mm long, 1.5-2 mm wide, pubescence short pilose and uncinata. Stipels inconspicuous, deciduous, linear, 0.7-1 mm long, ca 0.2 mm wide, pubescence as in stipules. Inflorescences axillary, solitary, short, biflowered; peduncle angular, caniculate-striate, 0.5-1.2 cm, rarely 2.2-3.5 cm, pubescence uncinata and short-pilose; pedicels paired at peduncle apex, 4-9 mm long, bent abruptly at base forming acute to right-angle with the peduncle. Bracts 3; inner bract not observed; middle pair persistent, lanceolate, concave around pedicel, 5-7 mm long, 2-3 mm wide, pubescence short pilose and ciliolate; outer bract deciduous, between pedicels, narrower, 4-6 mm long, 1-2 mm wide. Bracteoles membranaceous, translucent, deciduous, obovate to broadly ovate or nearly orbicular, 7-10 mm long, 5-7 mm wide, pubescence denser near base, short-pilose and ciliolate. Flowers medium-sized, 3.5-5 cm, pinkish-mauve to purplish-mauve, with vexillum medially yellowish. Calyx membranaceous, translucent, 10-nerved, five nerves prominently

raised and each extending into the lobe to the apex, five conspicuous nerves each extending to the sinus, pubescence uncinata and short-pilose, tube 9-10 mm long, 4-5 mm wide at base expanding to 7-10 mm wide at the throat, lobes lanceolate, long-acuminate, ciliate, 8-11 mm long, 3-3.5 mm wide near base, ventral lobe somewhat elongate, 11-15 mm long. Vexillum pubescence uncinata and with scattered, subappressed trichomes, blade 1.5-2.5 cm wide, claw 4-5 mm. Alae extended beyond carina 4-5 mm, blade obovate to spatulate, 11-16 mm long, 7-10 mm wide, claw 10-14 mm. Carina falcate, acute, blade 7-10 mm long, 3-5 mm wide, claw 13-17 mm. Staminal tube 14-17 mm long, with uncinata pubescence near base, free filaments 5-6 mm; anthers lanceolate, 1.2-1.4 mm long, 0.7-0.8 mm wide. Gynophore ca 1-1.5 mm; ovary 6 mm long, 1.5-2 mm wide, pubescence dense, appressed, whitish; style 15-18 mm, geniculate 4-6 mm from the distal end; pubescence at base similar to that of ovary, beard dense; stigma subglobular, 1 mm diameter. Legume sessile, flat, oblanceolate to lanceolate-elliptic, yellowish-green to green becoming light brown to tan in dry state, both sutures thickened, wavy, pubescence uncinata and puberulent, densest along sutures, valves typically 3-5 cm long, 10-15 mm wide (2-3 seeds per pod), rarely 2-2.5 cm long (1 seeded); stipe ca 1-2 mm, enclosed with legume base within a slightly shrunk, persistent calyx; beak 2-3 mm; dehiscence causing valve to twist ca one-half a turn. Seeds lenticular, face subreniform, smooth lacking any sticky coat, dark brown, ca 3 mm thick, 6 mm long, 6-7 mm wide; hilum 1.5 mm x 1 mm. Figure 75.

Kassner's Clitoria is characterized as a suffrutescent herb with 1- and 3-foliate leaves, medium-sized mauvish flowers paired on short,

Figure 75. Clitoria kaessneri. (a) portion of stem, x 1; (b) portion of stem bearing only unifoliate leaves, x 1; (c-d) leaflet variations, x 1; (e) flower, x 1; (f) calyx, x 1; (g) vexillum, x 1; (h) ala and carina, x 1; (i) androecium, x 1; (j) gynoecium, x 1; (k-m) legumes, x 1; (n) three views of seed, x 1. (Richards 17246, K-344: a. Fanshawe 3361, K-342: b. Young 1325, A: 3-i; BM; c, j. Fanshawe 7657, K-346: k-l. Mutimushi 1967, K-348: m-n. Young 695, BM: d.)





axillary peduncles, and producing small, flat fruits with non-viscid seeds. This species is easily distinguished from other species within the subgenus because of the low number of leaflets per leaf. This species may be confused with members of subgenus Neurocarpum which typically produce 1- and 3-foliate leaves, but which are distinguished by the turgid fruits (African introductions have costate fruits) and viscid seeds.

PHENOLOGY: Marks 1 reported that the species flowers during the wet season from December through February. Based on the data of specimens examined, flowers were collected from November through April, with the majority of the material agreeing with Marks' phenology. One specimen collected in mid-September had floral buds present. Fruits were collected from February through July.

TYPE COLLECTION: ZAÏRE: Lubemba Valley, Congo, 27 Jan 1908, Kassner 2385 (LECTOTYPE: BM. Isolectotype: K-11).

Harms cited Kassner 2385 but did not indicate where the type specimen was deposited. It is believed that the specimen was deposited at Berlin, and thus, destroyed during World War II. Of the two known syntypes, the British Museum specimen had better floral and vegetative material along with a packet containing two flowers, a gynoecium, and a data sheet. Therefore, it was selected over the Kew specimen as the lectotype. Both specimens examined, however, possess only 1-foliate leaves and lack the 3-foliate leaves described by Harms.

There is an obvious discrepancy between the spelling of the specific epithet and that of the collector's name. Kaessner varied the spelling of his name, sometimes dropping the e (e.g., Kassner

304), sometimes leaving the e in his name (e.g., Kaessner 650).

Harms chose to spell the specific epithet based upon the original spelling. The discrepancy was not considered to be an orthographic error.

VERNACULAR NAMES. ANGOLA: Muliatchioca (Chokwe), Exell & Mendonca 419. ZAMBIA: No native name, Marks 1.

ECONOMIC IMPORTANCE: ANGOLA: A remedy for the stomach [i.e. stomach ailments], Exell & Mendonca 419.

NOTES: The leaflets of this species are highly variable in form and number. Trifoliate leaves are the most common. A stem may have either all trifoliate leaves or all unifoliate leaves, the latter being quite uncommon. When both appear together on the same stem, trifoliate leaves typically occur at the lower nodes with unifoliate leaves at the uppermost nodes. Infrequently there occur 1-3 unifoliate leaves above the trifoliate leaves, and then a few trifoliate leaves above these unifoliate leaves. Rarely there occur stems in which the unifoliate leaves are below the trifoliate leaves.

Unifoliate leaves are typically larger than a leaflet from a 3-foliate leaf, and more consistent in form. Trifoliate leaflets show the most variability. Young 1325 (BM) has some terminal leaflets with nearly truncate apices, whereas the Gray Herbarium and Stockholm specimens have more typical apices. Fanshawe 7657 has terminal leaflets with short acuminate tips. Milne-Readhead 547 has two sheets at Kew, one of which has very narrow leaflets.

Fruits and seeds were not described by Harms in his original description of C. kaessneri. Fanshawe 7657 is the best specimen for

mature fruits. Mutimushi 1967 has good fruits, and is the only specimen examined which had seeds.

DISTRIBUTION (Figure 62): Clitoria kaessneri is an endemic to Southern Africa distributed in a narrow belt from ca 10-15°S. latitude in Angola, Zambia, and southernmost Zaïre. In Zambia, this species is reported from Cryptosepalum, Uapaca, Brachystegia, and Miombo woodlands on sandy soil or occasionally on brownish-red laterite soil, at altitudes of 600-1500 m.

A N G O L A. BENGUELA: Buccio, 2000 ft, 13 Mar 1938, Pittard 18 (BM-2 sh.). LUNDA: Lue Chassenque, Xá-Sengue, 3-9-1932, Young 717 (BM); Xá-Sengue, 1200 ft, 7 Apr 1937, Exell & Mendonca 419 (BM); Alto Cuilo, 2-9-1932, Young 695 (BM,GH,S). MOXICO? River Luenza, Vila Luzo, 3-11-1952, Young 1325 (BM,GH,S).

Z A M B I A (NORTHERN RHODESIA). Bush, 4500-5000 ft, Marks 1 (K); 24 Nov 1962, Fanshawe 7154 (K); Chati F.R., 7 Jul 1957, Fanshawe 3361 (K). WESTERN: source of River Zambesi, Mwinilunga, 13 Dec 1963, Robinson 6001 (K,M,NY): road to Matonchi, Mwinilunga dist., 1200 m, 16 Nov 1962, Richards 17246 (K); NE of Dobeka Bridge, Mwinilunga dist., 8 Nov 1937, Milne-Redhead 3157 (BM,K); Kitwe, 2 Apr 1963, Fanshawe 7657 (K); l.c., 10 Nov 1967, Fanshawe 10199 (K); l.c., 12 Jul 1968, Fanshawe 10441 (K); l.c., 13 Sep 1968, Mutimushi 2661 (K); 6 mi from Solwesi along road to Mwinilunga, 20 Nov 1972, Strid 2487 (K); Chifubwa R. Gorge 3 km S of Solwezi, 20 Mar 1961, Drummond & Rutherford-Smith 7128 (K); Mutanda Bridge, Solwezi dist., 20 Jun 1930, Milne-Redhead 547 (K-2 sh.); Solwezi, 13 Jan 1961, Holmes 1390 (K); l.c., National Monument, 8 Jan 1969, Mutimushi 2918 (K).

NORTHERN: Mpika, Jan 1956, Verboom 80 (K); l.c., 28 Jan 1955,  
Fanshawe 1871 (K). CENTRAL: Luano, 19 May 1967, Mutimushi 1967 (K).

Subgenus Neurocarpum

III. Clitoria L. subgenus Neurocarpum (Desv.) Baker, Fl. Br.

India p. 209. 1879; emend. Fantz

Neurocarpum Desv., Journ. Bot. 1: 119. 1813.

Vexillaria Raf., Am. Monthly Mag. Art. 2, p. 268, note 111.

1818.

Martia Leandro Sac., Denkschr. Akad. Muench. 7: 238, t. 12.

1812; non Martia Sprengl. 1818.

Martusia Schultes, Mant. 1: 69. 1822.

Rhombolobium Rich. ex H.B.K., Nov. Gen. Sp. 6: 406. 1824;

pro syn.

Neurocarpum Desv. ex Hamilton, Prod. Pl. Ind. Occ. 50.

1825; orthogr. err. pro Neurocarpum Desv. (1813).

Clitoria L. sect. Euclitoria DC., Prod. 2: 233. 1825.

Rhombifolium Rich. ex DC., l.c. 2: 235; pro syn.

Neurocarpum Desv. sect. Pilanthum Poir. ex Desv., Ann.

Sci. Nat. Ser. 1: 413. 1826.

Neurocarpus Desv. ex Hasskarl, Cat. Hort. Bogor. Alt. 276,

no. 1226. 1844; orthogr. err. pro Neurocarpum Desv.

(1813).

Clitoria L. sect. Neurocarpum (Desv.) Benth., Journ. Linn.

Soc. 2: 38. 1858.

Suffrutescent herbs or shrubs, erect, trailing, or climbing.

Leaves typically 3-foliate, occasionally 3- and 1-foliate, infrequently 1-foliate; leaflets small, 2-11 (15) cm long, 0.5-6 (10) cm wide, midrib above impressed to weakly raised, upper surface uncinat-pubescent or

glabrous, lower surface pubescent, trichomes moderately dense to scattered, lower surface often pale, glaucous. Trifoliate leaves petiolate; unifoliate leaves sessile, rarely petiolate. Petioles short, 2-6 (9) cm or subsessile and often shorter than rachis, 0.2-1.5 (2) cm, petiole rarely absent. Petiolules short, 1-6 mm. Inflorescence axillary, usually solitary, commonly bearing 1 or 2 flowers, occasionally 2- to 8-flowered, flowers chasmogamous or cleistogamous, extremely rarely bearing both chasmogamous and cleistogamous flowers on the same peduncle (cleistochasmogamous), racemose or occasionally paniculate; peduncle typically short, 0.5-7 (11) cm. Bracteoles ovate to lanceolate, inserted 0.5-2 mm below calyx, smaller than calyx. CHASMOGAMOUS FLOWERS small to moderately large, paired at nodes, showy, 2.5-7 cm, blue to purple or white. Calyx thick chartaceous to subcartilaginous, prominently 5- or 10-nerved, pubescence typically uncinatate with scattered, short, spreading to subappressed trichomes; lobes generally shorter than tube, occasionally subequalling to longer than the tube. Petals variable, Gynophore short, 1-5 mm, occasionally long (6-8 mm); ovary small, 5-9 mm. Stamens diadelphous. CLEISTOGAMOUS FLOWERS minute, inconspicuous, often borne at lower nodes in erect individuals and at the lower and upper nodes on trailing and climbing individuals. Corolla lacking or rarely with remnant petals borne within the hidden by the calyx; petal whitish, translucent, ca 1 x 0.1-0.3 mm. Calyx minute, tube 3-9 (11) mm long, 1-4 mm wide, lobes shorter than tube, typically 1.5-6 mm long. Gynophore subsessile, 1-2 (3) mm; ovary smaller than ovary of chasmogamous flower, 3-6 mm; style abruptly bent back and in contact with anthers. Stamens diadelphous, tube subsessile (0.1 mm) to conspicuous (3-5 mm). Legume stipitate, convex, weakly to

strongly depressed between seeds and ecostate, or turgid and costate (costa occasionally incompletely formed to lacking), nearly straight to subfalcate; stipe 4-17 mm. Seeds dark brown to black, typically subcuboidal, thickened (2) 3-4 mm, small (3-6 mm long or wide), viscid, usually 1-10 seeds per pod. Seed germination hypogean. ( $\times=12$ ).

The members of subgenus Neurocarpum can be characterized as shrubs to suffrutescent herbs with 3- and 1-foliate leaves, bearing axillary peduncles with two to few chasmogamous or cleistogamous flowers, and convex, sometimes costate fruits bearing viscid seeds.

Costate fruits, viscid seeds, cleistogamy, and unifoliate (except C. kaessneri) leaves are unique to this subgenus. A convex fruit, chartaceous to cartilaginous calyx, and low leaflet number are additional characters that segregate members of subgenus Neurocarpum from the suffrutescent members of subgenus Clitoria.

LECTOTYPIC SPECIES: C. laurifolia Poir. (Type of subgenus based upon Neurocarpum janensis Desv., a synonym of C. laurifolia, and not the type of C. laurifolia. Type collection is Hb. Desvaux, P-59.)

Baker did not select a type species for the subgenus nor directly indicate the source of the subgeneric epithet. He described the subgenus as "Pod turgid, with a rib along the face of the valves." Baker cited one species (C. cajanaefolia Benth. with Neurocarpum cajanaefolium Presl. and N. retusum Hassk. cited in synonymy) for subgenus Neurocarpum.

The name Neurocarpum had been closely associated with Clitoria for over sixty years prior to Baker's publication. Desvaux (1813) described Neurocarpum as a genus noting the unusual character of a costate fruit. By 1825, de Candolle had placed Neurocarpum next to the genus Clitoria. In 1858, Bentham combined Neurocarpum with Clitoria and treated



Neurocarpum as a section of the genus Clitoria. Bentham (1862) followed the same treatment for the genus Clitoria in Martius and Eichler's "Flora Brasiliensis," a reference which Baker cited. Baker followed Bentham's treatment but elevated Neurocarpum from a section to the subgeneric level.

The origin of Neurocarpum lies with Desvaux. Desvaux (1813) described the genus Neurocarpum, but did not indicate a type. He did state "J'y place la Crotalaria gajanensis, et une espece nouvelle (Neurocarpum ellipticum Desv.)." In 1814, Desvaux described the genus Neurocarpum more fully and included two species: Neurocarpum janensis (syn. Crotalaria Guyanensis Aub. and Crotalaria longifolia Lam.) and Neurocarpum ellipticum. Two syntypic species exist from which the lectotype can be chosen.

Desvaux often altered the spelling of names. The names cited in synonymy correctly should be Crotalaria guianensis Aubl. and Crotalaria longifolia Lam. Although Desvaux's specific epithet for the first species was based upon Aublet's name, guianensis, Desvaux (1813) altered the name to gajanensis and then (1814) to janensis. A specimen in Herb. Desvaux (P-59) labeled "hab. in gujanae" bears both the names Crotalaria gujanensis Aubl. and Crotalaria longifolia Lam. The data agree with Desvaux's citation (1814) of "Habitat in Gujanâ." In a darker ink, Neurocarpum is written above Crotalaria, and gajanensis is written above the two specific epithets. This is the probable holotype for Desvaux's first species. No type was located in Desvaux's Herbarium bearing the name N. ellipticum. Therefore, the only known type existing for the name was selected as the lectotype for Neurocarpum, and hence, is the type for the subgenus.

Desvaux had misidentified the type specimen. It does not agree with the type of Aublet. Instead it should correctly be included with Clitoria laurifolia Poir. (1811), and Neurocarpum janensis Desv. (1814) being reduced to synonymy by the rule of priority. Coincidentally, the only species cited by Baker when he published Neurocarpum as a subgenus of Clitoria (C. cajanaefolia Benth.) is also correctly included as a synonym of C. laurifolia.

When Bentham (1858) placed Neurocarpum as a section under the genus Clitoria, he described the section based upon leaflet number, habit, a costate legume, and viscid seeds. Baker (1879) based the subgenus only on the one character, the costate legume. Baker excluded two species (C. mariana and C. macrophylla) which Bentham had included within Neurocarpum. Both species lack costate fruits. Bentham noted that the character of a costate fruit can be inconsistent within a species and even on the same individual. The present treatment agrees more closely with Bentham as examination of specimens has indicated imperfectly formed costas and occasional ecostate within the species of C. falcata, C. laurifolia, and C. guianensis. Individual plants can bear legumes in which the nerve is lacking or incompletely formed on the valves. Neurocarpum as described in this treatment includes a number of additional characters which renders this subgenus more natural. Species cited agree with Bentham's concept of Neurocarpum. There is, however, agreement with Baker's concept of Neurocarpum as a subgenus, not a section (refer to discussion under the genus, pp. 189-191, for details). Baker's description has been emended, therefore, to include species with noncostate fruits, but which have viscid seeds, hypogean germination, convex valves on the legume, chartaceous-subcoriaceous

calices, 1- and 3-foliate leaves, and additional secondary characteristics which unify the subgenus and segregates its members from those of other subgenera.

NOTES: Species of subgenus Neurocarpum have been separated traditionally by their habit or vegetative characters. When keys are provided, the first division is usually based on the habit, a practice initiated by Bentham in 1858. He divided the species into three groups: (1) those species with climbing stems; (2) those species with prostrate stems; and (3) those species with ascending or erect stems from a lignose rhizome. Several species transgress these divisions. Clitoria mariana produces erect stems, lignose, which elongate under good growing conditions and become voluble, climbing over the herb layer and low shrubs. Clitoria polystachya is an erect species with occasional collections made of climbing individuals. Clitoria falcata is a voluble climber, although individuals from open areas are reported by the collectors as prostrate. Clitoria nana grows prostrate, or has ascending branches. Clitoria densiflora has been reported as an erect herb, a prostrate herb, and as a climber.

Another character frequently used for segregation is leaflet number. Clitoria simplicifolia is usually segregated early because all leaves are 1-foliate. Other species, however, typically produce both 3-foliate and 1-foliate leaves on a stem and occasionally have individuals whose stems may bear only the 1-foliate leaves.

Petiole length is also used for segregation. There are two distinct groups, those with distinct petioles (typically 2-9 cm long), and those with subsessile petioles (typically 0.2-1.5 cm long) that are often shorter than the rachis. Clitoria hanceana has individuals with

subsessile leaves and those with petiolate leaves, the petioles typically 1-2 cm. It appears generally that climbing members have petiolate leaves whereas the subshrubs or woody herbs bear the sessile leaves. Exceptions occur mostly with the shrubbier Mexican species and species from the United States.

Leaflet shape and apices are often used for segregation. In many species, leaflets exhibit a great deal of variation.

Fruits are rarely used, unless to note the character of the presence or absence of the median costa on the valve. This characteristic can be variable within a species, or even on an individual plant.

Examination of this subgenus indicates that there are probably three basic sections based upon a combination of characters and geographical distribution (Table 13). The Southeast Asian group has calices with elongated lobes that are subequal to longer than the tube. This characteristic is unknown elsewhere within the genus, as the lobes in other sections are shorter than the tube. The calyx also is dark-colored and bears a dense uncinatate pubescence. Inflorescences are often fascicled with short peduncles (to 1.5 cm long) bearing small white flowers. Fruits are ecostate, weakly depressed between the seeds, and bear seeds that are slightly longer than wide. Cleistogamy is unknown in this group and is presumed absent. Leaves are petiolate or sessile, and 1- and 3-foliate, the unifoliate leave petiolate.

The group occurring from Mexico to Honduras appears closely related to the Asian group. The fruits and flowers tend to agree, but the calyx lobes are shorter than the tube, flowers are borne on elongate (2-13 cm), solitary inflorescences, and cleistogamy is known for most species. Leaves are all petiolate and only 3-foliate.

Table 13. A comparison of the sections of subgenus Neurocarpum.

CHARACTER	MEXICANA	TANYSTYLOBA	NEUROCARPUM
LEAVES:			
Leaflet number.	3-foliolate	3- and 1-foliolate	3- and 1-foliolate
Petiole.	Petiolate	Petiolate or subsessile	Petiolate or subsessile
INFLORESCENCE:			
Axis length.	(1) 2-13 cm	0.3-1.5 (2) cm	1-10 (20) cm
Number per axil.	Solitary	Fascicled to Solitary	Solitary
CHASMOGAMOUS FLOWERS:			
Flower size.	Small, 2.5-4 cm (4-6 cm in <u>C. mariana</u> )	Small, 2.5-4 cm	Medium-large, (3.5) 4-7.5 cm
Flower color.	White or blue to purple	White	Blue to purple (white)
Calyx tube.	Short, 7-12 (14) mm	Short, 6-12 mm	Long, 11-22 (25) mm
Calyx lobes.	Shorter than tube	Longer to subequal tube	Shorter than tube
Staminal tube	Short, 1.3-2.2 cm	Short, 1.3-2.2 cm	Long, 2-4 cm
Style.	(2-3 cm in <u>C. mariana</u> ) Short, 1-2 cm	Short, 1-1.6 cm	Long, 1.9-3 cm (1.4-1.9 cm in <u>C. falcata</u> )
CLEISTOGAMOUS FLOWERS:			
Calyx tube.	Present	Absent	Present
Calyx lobes.	Small, 3-6 mm		Large, 5-9 (11) mm
Staminal column.	Small, 1.5-3 mm Elongate, 3-5 mm, or Nearly lacking, ca. 0.1 mm		Long, 3-7 mm Short, 0.5-1.5 mm
LEGUME AND SEEDS:			
Depressed between seed.	Weak to strongly	Weakly	Turgid, not depressed
Costa longitudinal.	Ecostate	Ecostate	Costate or occasionally ecostate
Seed length/width	Width slightly longer than length	Width slightly longer than length	Length slightly longer than width
Legume width	Narrower, 5-9 mm	Broader, 7-11 mm	Broader, 7-11 mm

The South American group, which has a few species extending into the West Indies and into Central America, is much different. Fruits are turgid at maturity, not depressed between the seeds, and often bearing longitudinal, median nerve. Seeds are typically slightly longer than wide. The calyx tube, style, and staminal tube are longer than in the other two groups. Flowers average larger, and are typically blue to purple, occasionally white. Cleistogamy is also present in most species. Whereas most structures of cleistogamous flowers are similar to the Mexican-Honduran group, the staminal tube is conspicuously shorter. Leaves are similar to the Asian group.

Three species do not easily fit into any of these three groups. Clitoria mariana and C. fragrans are closely related to each other. Both have ecostate fruits which are conspicuously depressed between the seeds. The seeds are slightly longer than wide. Flowers of C. fragrans have structures agreeing with the Mexican group. Flowers of C. mariana have structures that agree with some of the flowers of the South American group. The staminal tube is nearly lacking in the cleistogamous flowers, which differs from both groups. Leaves are petiolate as in the Mexican group, and these agree only with leaves of the climbing members of the South American group. Both species have erect stems, whereas the erect stems of South American members bear subsessile leaves. Affinities of C. mariana and C. fragrans are with the Mexican group although they differ by the larger, bluish flowers, deeper depressions between seeds on the legume valves, longer gynophores, and the nearly lacking staminal tube of the cleistogamous flowers. Both species occur in the United States with C. mariana having a disjunct variety in Asia. The differences do not seem to warrant a separate section, so these two

species are included with the Mexican section with their closest affinities appearing to lie with C. mexicana.

The third species, C. cordobensis, presents more of a problem. This species is an endemic of northern Argentina. The fruits are ecostate, weakly depressed between the seeds, and bear seeds that are slightly wider than long. Flowers are small and white. Leaves are 3-foliate and petiolate. The cleistogamous flowers have staminal tubes nearly as long as the Mexican group. These characteristics indicate that C. cordobensis is not closely related to its neighboring South American species, but has its affinities with the Mexican group. How this species became widely separated from its apparent relatives, located on the opposite side of the tropics, is unknown.

DISTRIBUTION (Figures 12 and 13): The members of subgenus Neurocarpum exhibit a disjunct distribution, with most species native to the neotropics or subtropics, with one species extending into the temperate zone of the eastern United States. These species range from northern Argentina, Paraguay, and the Brazilian state of Rio Grande do Sul to and including Mexico, the West Indian islands, and the eastern United States. A few species occur in southeast Asia, from eastern India to southern China, to southern Burma and Thailand, with one species in Arnhem, Australia. The subgenus does not appear to be native to Africa or Indonesia. However, one species has been introduced into Indonesia and portions of southeast Asia (India, Ceylon, Malaysia), and into Africa (Zaire) where it has become naturalized. A second species has been introduced into western Africa and also now has become naturalized.

Members of the subgenus typically are found in open areas in drier woodlands, scrub habitats, and grass lands and savannas. They range from near sea level to upper mountain slopes at elevations of 1000 to 2000 m, occasionally to 2700 m.

KEYS TO SECTIONS:

1. Legume weakly to strongly depressed between seeds, ecostate; seeds with the width slightly longer than the length; staminal tube of cleistogamous flowers elongate, 3-5 mm, or nearly lacking, ca 0.1 mm long; staminal tube of chasmogamous flowers short, 1.3-2 cm (2-5 cm in C. mariana); style short, 1-2 cm; calyx tube short, 7-12 (14) mm; flowers typically small, 2.5-4.5 cm (to 6 cm in C. mariana), white or occasionally bluish.
2. Calyx lobes shorter than the tube length; inflorescence solitary, elongate, (1) 1.5-13 cm; gynophore elongate, 3-5 (8) mm; uncinat pubescence of calyx moderate to scattered; leaves 3-foliate, petiolate, leaflets uncinat-pubescent on upper surface becoming glabrate; cleistogamy present (native to Honduras to Mexico, and Eastern United States, with C. mariana in SE Asia). . . . . sect. IIIa. Mexicana
2. Calyx lobes longer than tube length to subequal tube length; inflorescence often fascicled, contracted, 0.3-1.5 (2) cm; uncinat pubescence of calyx dense, conspicuous at 20-30x; leaves 1- and 3-foliate, petiolate or subsessile, leaflets glabrous on upper surface or bearing remnant trichomes along midrib; cleistogamy absent (SE Asia and N. Australia) . . . . . sect. II Ib. Tanystyloba



1. Legume turgid at maturity, not depressed between the seeds, costate or occasionally ecostate; seeds with the length slightly longer than the width, staminal tube of cleistogamous flowers short 0.5-1.5 mm; staminal tube of chasmogamous flowers elongate, 2-4 cm; style elongate, 1.9-3 cm (1.4-1.9 cm in C. falcata); calyx tube elongate, 11-25 mm; flowers typically medium to large, (3.5) 4-7.5 cm, blue to purple or occasionally white (South America, West Indies, Central America to S. Mexico; introduced and naturalized in W and central Africa, and SE Asia and Indonesia). . . . .
- . . . . . sect. IIc. Neurocarpum.

Section Mexicana

IIa. Clitoria L. subg. Neurocarpum (Desv.) Baker emend. Fantz

sect. Mexicana Fantz, sect. nov.

Vexillaria Raf., Ann. Monthly Mag. Art 2, p. 268, note 111.

1818.

Clitoria L. sect. Euclitoria DC., Prod. 2: 233. 1825;

nom. illeg.

Leaves 3-foliate, petiolate. Inflorescence axillary, solitary, paniculate or racemose, (1-) 2- to several-flowered; main axis (1) 2-13 cm long. Flowers chasmogamous or cleistogamous. Chasmogamous flowers showy, white or blue to purple, typically small, 2.5-4 cm or occasionally to 6 cm. Calyx tube short, 7-12 (14) mm, lobes shorter than tube length; pubescence of moderate to scattered, uncinat trichomes and subappressed, macroscopic trichomes. Staminal tube typically short, 1.3-2.2 cm, occasionally to 3 cm. Style short, 1-2 cm. Cleistogamous flowers minute. Calyx tube small, 3-6 mm, lobes small, 1.5-3 mm. Staminal tube elongate, 3-5 mm, or nearly lacking, ca. 0.1 mm. Legume weakly to strongly depressed between seeds, ecostate. Seeds slightly wider than long.

Members of the section Mexicana can be characterized by their 3-foliate, petiolate leaves, elongated inflorescences, and ecostate fruits which are somewhat depressed between the seeds. Cleistogamous flowers are often produced and typically have smaller tubes and lobes than members of the section Neurocarpum, and either an elongate staminal tube, or nearly free stamens.

HOLOTYPE SPECIES: C. mexicana Link

The placement of de Candolle's section Euclitoria as a synonym under one of the three sections of subgenus Neurocarpum is difficult. De Candolle cited six species under his section, without indicating a type species. He described the section as "Calyx tubulosus. Vexillum ecalcaratum. Folia unijuga cum impari." Three of the species, C. mariana, C. glycinoides, and C. poitaei, were known to de Candolle through the examination of specimens, as indicated by his notation "v.s." (i.e. vidi siccam, I have seen it in a dried state). The other three species are presumed to be known only from the literature since they lack any notation. Two of these species, C. formosa and C. angustifolia, tend to support this idea. Both have campanulate calices and spurred-vexillae, characteristics which are contrary to de Candolle's description of section Euclitoria, but which agree with de Candolle's section Centrosema. The type species would probably lie with one of the species whose specimens had been examined by de Candolle. C. glycinoides was cited as C? glycinoides by de Candolle who expressed some doubts over the placement of the species here or with the genus Neurocarpum. It is doubtful that de Candolle had this species in mind as the representative species. Of the remaining two species, C. mariana is the more probable type species for section Euclitoria, because it agrees with the description and was listed as the first species by de Candolle. Clitoria poitaei was cited last by de Candolle. In the present treatment, C. poitaei is not recognized as a member of subgenus Neurocarpum, C. glycinoides belongs to section Neurocarpum, and C. formosa and C. angustifolia are excluded from the genus. Thus, only C. mariana and C. mexicana, the first two species

cited by de Candolle and the more probable representatives of Euclitoria, remain. Both species are included under the newly proposed section Mexicana, thus de Candolle's name Euclitoria has been placed in synonymy under this section.

Placement of de Candolle's section is not important from a nomenclatural viewpoint since Euclitoria is an illegitimate name in accordance with the International Code of Botanical Nomenclature (Stafleu, 1972). The Code forbids the use of the prefix "Eu-" used with the generic name since that taxon would bear the generic name or a plural adjective agreeing in gender with the generic name (Art. 21). The name Euclitoria is a misnomer since the type species, C. ternatea and hence the "true clitoria," has never been associated with de Candolle's section Euclitoria.

Section Mexicana was originally based upon the Mexican species and later expanded to include the more temperate species of the United States and Argentina. Clitoria mexicana was selected as the holotypic species because it has the typical characteristics of the Mexican species, yet some of the characteristics similar to those additional species later included. With the total concept of the section somewhat altered, C. mexicana becomes a representative intermediate species.

DISTRIBUTION (Figure 12): Section Mexicana has a disjunct distribution. Most of the species occur from Honduras to Mexico, and the eastern United States, with one species in northern Argentina, and one variety in Southeast Asia. Members typically occur in dry, sandy soils, often associated with drier woodlands of mountain slopes, to elevations of ca 2700 m.

KEYS TO THE SPECIES: Floral characteristics, unless otherwise noted, refer to the chasmogamous flowers.

1. Gynophore short, 3-4 mm, much shorter than the ovary; fruits weakly depressed between seeds; staminal tube of cleistogamous flowers elongate, 3-5 mm; flowers white or pale yellow, occasionally purple, small-sized, 2.5-4 cm long.
2. Stipe short, 4-8 mm, enclosed within calyx; carina blade 5-9 mm long; carina claw 12-17 mm; style 10-17 mm; staminal tube of cleistogamous flowers 4-5 mm.
3. Calyx lobes 2-5 mm; flowers 2.5-3 cm; inflorescence paniculate or occasionally racemose, several flowered (2- to 8-flowered); shrubs to subshrubs.
4. Stem pubescence ascending, appressed to subappressed; calyx lobes 2-4 mm; bracteoles 4-7 mm (occasionally to 9 mm in polystachya variety); flowers white, vexillum short-clawed, claw 4-7 mm; cleistogamous flowers present.
5. Inflorescence paniculate, several-flowered; style 13-17 mm; ovary ca 1 mm wide, pubescence dense, appressed, whitish macroscopic trichomes; petiolule 3-5 mm; alae blade 12-14 mm long, claw 8-11 mm; carina blade 7-8 mm long; leaflets average broader, 2-6 cm, primary nerves of 8-12 pair, petiole longer, 4-10 cm (central Mexico to Panama) . . . . .  
 . . . . . 35. C. polystachya
5. Inflorescence racemose, few-flowered; style 10-11 mm; ovary ca 0.7-0.8 mm wide, pubescence moderate,

- uncinate; petiolule 2-3 mm; alae blade 8-11 mm long, claw 10-14 mm; carina blade 5-7 mm long; leaflets average narrower, 1.5-3.5 cm, primary nerves of 6-9 pair, petiole shorter, 3-6 cm (Baja, California) . . . . . 36. C. monticola
4. Stem pubescence spreading; calyx lobes 4-5 mm; bracteoles 7-9 mm; flowers lilac to purple, vexillum long-clawed, claw 8-9 mm; cleistogamous flowers absent (southwestern Mexico) . . . . . 37. C. triflora
3. Calyx lobes 6-8 mm; flowers 3-4 cm; inflorescence racemose, 2- to 4-flowered (occasionally 6- to 8-flowered); perennial herbs, erect to climbing.
6. Plant trailing to climbing vine; calyx tube 9-12 mm, purplish; bracteoles 5-9 mm; inflorescence elongate, 2-11 cm; leaflets ovate to lanceolate; stipule 6-9 mm; alae extended beyond carina 4-6 mm (southern Mexico to Nicaragua) . . . . . 38. C. mexicana
6. Plant erect herb; calyx tube 7-9 mm, greenish; bracteoles 3-4 mm; inflorescence sublackling, ca 0.2-0.3 cm; leaflets oblong; stipule 4-6 mm; alae extended beyond carina 8-9 mm (north central Mexico) . . . . . 39. C. humilus
2. Stipe elongate, 8-16 mm, exerted beyond calyx tube; carina blade 10-11 mm long; carina claw 18-22 mm; style 8-10 mm; staminal tube of cleistogamous flowers 3-4 mm (northern Argentina) . . . . . 40. C. cordobensis

1. Gynophore elongate, 4-8 mm, slightly shorter than ovary length; fruits conspicuously depressed between seeds; staminal tube of cleistogamous flowers nearly lacking, ca 0.1 mm, stamens appearing to be nearly free; flowers blue to lilac to pale purple, 3.5-6 cm long.
7. Calyx tube 7-10 mm, purplish; staminal tube 17-22 mm; leaflets narrow, 0.5-1 cm wide, primary nerves of 6-8 pair; stipule 2-4 mm; stipels 1-3 mm; stipe elongated, 15-21 mm (9-14 mm in cleistogamous flowers); bracteoles of cleistogamous flowers 2 (3) mm; calyx tube of cleistogamous flowers 3-4 mm (southern Florida) . . . . . 41. C. fragrans
7. Calyx tube 10-14 mm, greenish; staminal tube 21-30 mm; leaflets broad, 1-4 (6.5) cm, primary nerves 7-12 pair, stipule 5-10 mm; stipels 3-8 mm; stipe short, 5-17 mm (5-10 mm in cleistogamous flowers); bracteoles of cleistogamous flowers 3-5 mm; calyx tube of cleistogamous flowers 4-5 mm (eastern United States and southeast Asia) . . 42. C. mariana
35. Clitoria polystachya Benth., Pl. Hartw. p. 60. 1840.  
Clitoria multiflora Mart. & Gal., Bull. Acad. Brux. 10: 188. 1843; nom. illeg.; non Swartz (1788).  
Ternatea multiflora (Mart. & Gal.) Kuntze, Riv. Gen. Pl. 1: 210. 1891.  
Ternatea polystachya (Benth.) Kuntze, Riv. Gen. Pl. 1: 210. 1891.  
Clitoria velutina Standley, Field Mus. Nat. Hist. Bot. 22: 24. 1940.

Shrub, 0.6-5 mm tall, erect or rarely with apex climbing. Branches angular to terete, 3-6 mm diameter, pith minutely hollow, juvenile branches with pubescence dense, trichomes short, rufous, spreading, becoming moderately dense to glabrate, trichomes grayish, subappressed; internodes 1-5 cm. Leaves 3-foliate, chartaceous, petiolate, leaflets oblong-lanceolate to oblong-ovate to lanceolate, apex tapered from above middle, acute to long-acuminate, base rotund to weakly retuse, midrib above weakly raised, primary nerves of 8-12 pair, upper surface dark green, dull, pubescence uncinata to glabrate, occasionally bearing 0.5 mm long trichomes, well scattered, lower surface green to slightly pale green, pubescence moderately dense to moderate, velutinous, lamina 4-12 (15) cm long, 2-5 (6.5) cm wide; terminal leaflet typically larger than lateral leaflets. Petioles angular, longitudinally striated, 3-8 (10) cm, pubescence dense, trichomes tawny, spreading; rachis 1-3.5 cm. Petiolules subquadrangular, dark-colored, 4-6 mm, pubescence dense, spreading. Stipules persistent, linear-lanceolate, acute to short-acuminate, acumen 1-2 mm, 4-8 (11) mm long, 1.5-2 mm wide, pubescence moderately dense, pilose, stipels persistent, linear, acute, pubescence dense, pilose, terminal stipel 4-7 mm long, ca 0.5 mm wide, lateral stipels 6-10 mm long, 0.5-1 mm wide. Inflorescence axillary or terminal, 1-3 per node, paniculate or occasionally a contracted panicle, several-flowered; axis pubescence dense, spreading, trichomes short, tawny, central axis typically 5-8 cm long, peduncle 3-7 cm, rachis internodes 6-11 mm, lateral primary axes short, 4-7 mm long, typically 2- to 4-flowered each. Pedicels 3-5 mm. Bracts linear, acute, 3-5 mm long, 0.5-1 mm wide, densely pubescent. Flowers chasmogamous or cleistogamous. CHASMOGAMOUS FLOWERS: Bracteoles persistent, linear,



3-7 (9) mm long, 1 mm wide, densely pubescent, inserted to 1 mm below calyx. Calyx pubescence of uncinata and scattered, subappressed trichomes, 10-nerved, five nerves leading to a lobe apex, five nerves extending to a sinus where each nerve forks dichotomously, sending a somewhat inconspicuous branch into each lobe, tube (7) 8-12 mm long, 2-3 mm wide at base expanding to 5-6 mm at the throat, lobes deltoid-ovate, acuminate, 1-nerved to weakly 3-nerved, sparsely pubescent, 2-4 mm long, ca 2 mm wide at base, ventral lobe 4-7 mm. Vexillum small, 2.5-3 cm long, 1.5-1.9 cm wide, white with a dark reddish center, calw 4-7 mm; pubescence of outer surface moderate, strigose. Alae white, oblong, blade 12-14 mm long, 5-6 mm wide, extended beyond the carina 2-4 mm, claw 8-11 mm. Carina white, falcate, blade 6-8 mm long, 2-3 mm wide, claw 13-17 mm. Staminal tube 16-20 mm long, free filaments incurved, 2-3 mm, vexillary stamen coherent near the middle; anthers ovate, 1 mm long, 0.4-0.7 mm wide. Gynophore 3-4 mm; ovary 7-8 mm long, 0.8-1 mm wide; pubescence dense, appressed, whitish, with mid lateral face lacking these macroscopic trichomes, style 14-17 mm, geniculate from the distal end ca 5-6 mm; stigma capitate. Legume stipitate, base enclosed within calyx, valves convex, weakly depressed between seeds, ecostate, (3) 4-5 cm long, 6-8 mm wide, pubescence scattered, appressed; stipe 4-7 mm; beak 2-6 mm; dehiscence causing valve to twist ca one-quarter to three-quarters of a turn. Seeds black, viscid, weakly subreniform, face truncate at base and apex, 2-4 mm long, 3-6 mm wide, 2-3 mm thick, ca 3-6 seeds per pod; hilum ca 1 x .05 mm. CLEISTOGAMOUS FLOWERS inconspicuous, borne on shorter inflorescences, 1-6 cm long, often appearing crowded. Bracteoles 3-4 mm long. Calyx tube 4-6 mm long, lobes 2-3 mm long. Staminal tube elongate, 4-5 mm long. Legume

similar to those borne by chasmogamous flowers, somewhat smaller, 2.5-4.5 cm long, 6-8 mm wide; stipe 5-7 mm. Seeds similar, ca 2-5 seeds per pod. Figures 76 and 77.

Hartweg's Clitoria can be characterized as a shrub with axillary, multi-flowered, paniculate inflorescences bearing small white flowers or ecostate, strigose fruits that are weakly depressed between the seeds, and 3-foliate leaves with broad leaflets.

PHENOLOGY: The showy chasmogamous flowers are borne from June to October, with fruits rarely collected in September. Cleistogamous flowers and fruits were collected in June, August, and November to January.

TYPE COLLECTION: MEXICO. Talea, 1839, Hartweg 454 (LECTOTYPE: K-16, Hb. Bentham, photo at S. Isolectotypes: CGE-Hb. Lindley; W 18668, Hb. Reichenbach fil.).

When Bentham published the name C. polystachya in a synopsis of Hartweg's Mexican collection, he cited only the one collection, but did not designate where the type specimen was deposited. The specimen from his personal herbarium, now deposited at Kew, is the only specimen that Bentham is known to have examined, and it agrees well with the original description. This specimen has a number of inflorescences, each bearing several flowers, and a separate fruiting inflorescence. The Kew specimen is being designated as the lectotype since it represents the probable type specimen.

The specimen at Cambridge University has mature fruits, but lacks mature flowers which Bentham described. The Wein specimen has one inflorescence (does not agree with name polystachya, "many spikes") with mature flowers, but immature fruits. Bentham never distinguished

Figure 76. Clitoria polystachya - I. Var. polystachya: A flowering branch. (Hartweg 454, K-16.)



Figure 77. Clitoria polystachya - II. Var. polystachya: (a) leaflet, x 1; (b) inflorescence, x 1; (c) flower, x 1; (d) calyx, x 1; (e) vexillum, x 1; (f) ala and carina, x 1; (g) androecium, x 1; (h) anther, x 10; (i) gynoecium, x 1; (j) stigma and style apex, x 8; (k) ovary with typical lateral pubescence, x 3; (l) fruit, x 1; (m) open fruit, x 1; (n) three views of seed, x 1. Var. congesta: (p) inflorescence at node, leaf removed, x 1; (q) flower, x 1; (r) fruiting inflorescence, x 1. (Hartweg 454, K-16: a-c,l; Lent 1164, NY: d-k; Williams 18260, US 2189146: m-n; Hinton 8597, US 1979941: o,r; Hinton 4447, NY: p-q.)



between chasmogamy and cleistogamy in any of his descriptions of Clitoria species. The fruits from the type collection come from cleistogamous flowers.

VERNACULAR NAMES: GUATEMALA. Vainilla, Steiermark 30925 and Standley (1946); Buniju, Steiermark 30925.

NOTES: Martius and Galeotti (1843) reported that the species was scandent when they described C. multiflora (a synonym of C. polystachya). The syntype specimen, Galeotti 3290 (BR-8), is the only specimen among those examined for the species, in which the branch has a slight twining, viney appearance. This specimen comes from Mirador, Vera Cruz, Mexico. All other collectors reported the habit as either that of a shrub or a subshrub.

A variety endemic in District Temascaltepec, Mexico, Mexico, has contracted panicles. The flowers are congested into axillary bundles of white flowers, each with the center reddish, that gives it an ornamental appearance. This variety is not cultivated, but would be worthy of a trial. The bracteoles and stipules are larger than the typical variety, but the calyx tube and lobes are smaller, and the leaflets are weakly cordate at the base.

A second variety endemic to Mexico has the loose arrangements of flowers and elongated penduncles like the typical variety, but larger stipules and bracteoles of the other variety. This variety appears to be intermediate.

Clitoria polystachya has seldom been confused with other species. Occasionally it has been mistaken for C. mexicana which is a vine with large flowers, longer calyx lobes, and glabrous fruits. Clitoria polystachya has its closest affinities with C. monticola which has

narrower leaflets, short petioles, few-flowered, racemose inflorescences, and glabrate fruits.

DISTRIBUTION (Figure 78): Clitoria polystachya is distributed from central Mexico to Honduras with an isolated collection from Nicaragua, Costa Rica, and western Panama. This species is typically associated with rocky wooded slopes and ravines at elevations of 800-2200 m. Forests are typically reported as pine or pine-oak associations. The Panamanian collection is the only one reported from a savanna. Williams et al. 28005 reported the species from montane rainforests or cloud forests. McVaugh 16191 collected the plant on a red clay soil.

#### KEY TO VARIETIES:

1. Flowers loosely arranged, separated on the inflorescence axis;  
inflorescence elongated, 3-16 cm; calyx tube 8-12 mm, lobes  
3-4 mm; leaflets with rotund base.
  2. Stipules 4-7 mm; bracteoles 4-6 mm (Mexico to Panama) . . .  
. . . . . 35a. var. polystachya
  2. Stipules 7-10 mm; bracteoles 6-8 mm (Mexico) . . . . .  
. . . . . 35b. var. pringlei
1. Flowers congested, appearing fascicled at peduncle apex;  
inflorescence contracted, 1-3 cm; calyx tube 7-9 mm, lobes 2-3 mm;  
leaflets with base rotund to weakly cordate (Mexico) . . . . .  
. . . . . 35c. var. congesta

35a. Clitoria polystachya Benth. var. polystachya

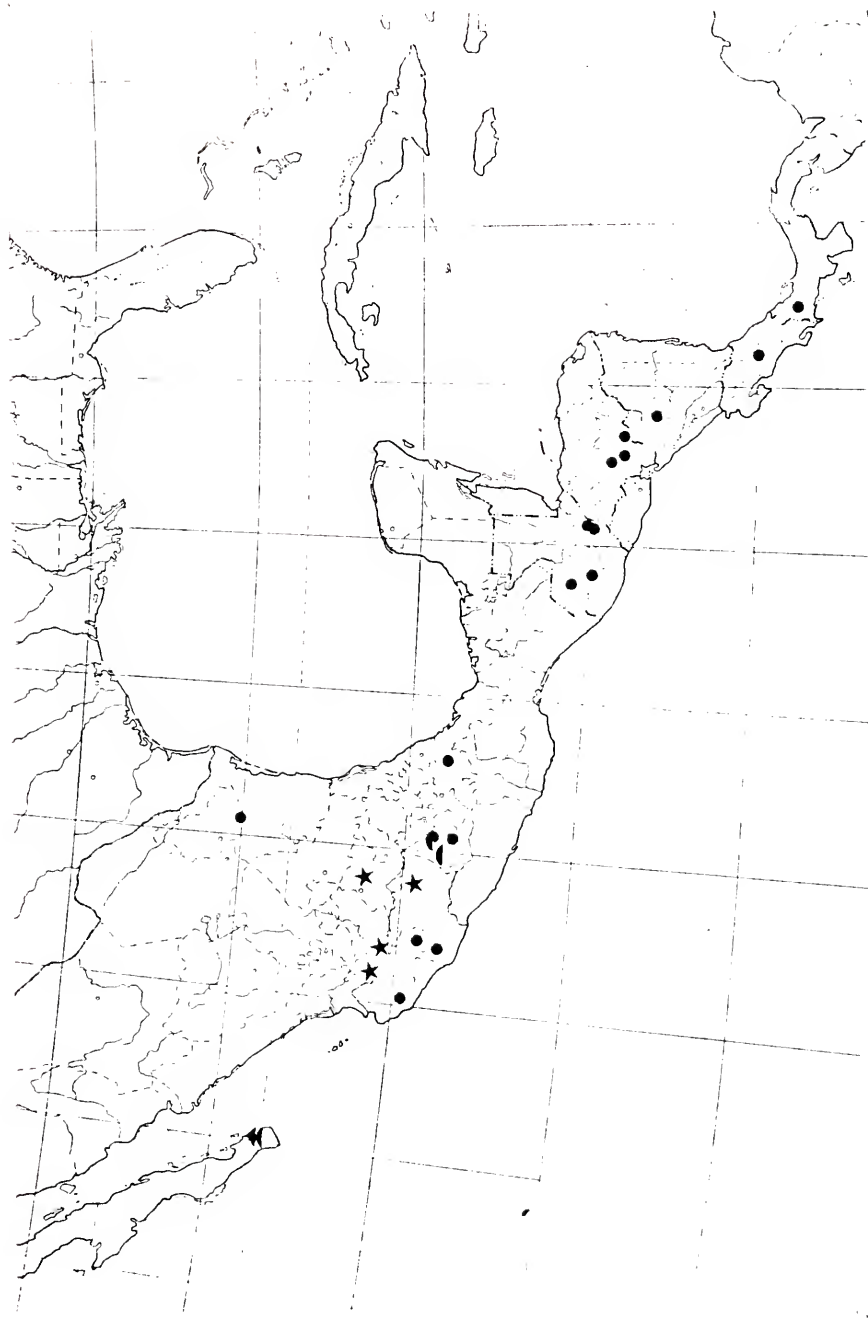
Leaflet base rotund. Stipules 4-7 mm. Inflorescence elongated, 3-16 cm, flowers loosely arranged, separated. Peduncle 1.5-7 cm. Calyx tube 8-12 mm long, lobes 3-4 mm. Bracteoles 4-6 mm long.



DISTRIBUTION (Figure 78): The typical variety is distributed from central Mexico to western Panama.

M E X I C O. 1791, Haenke 1209 (F,PR); 1787-1804, Sesse et al. 2020 (F). NUEVO LEÓN: Ducles Nombres & just east of border into Tamaulipas, 25°N-99.5 to 100.5°W, 1100 m, 19 Jul 1948, Meyer & Rodgers 2810 (MO-2 sh.). JALISCO: 10 mi S of Autlán toward La Resolana, 4600 ft, 20 Aug 1949, Wilbur & Wilbur 2447 (MICH); Sierra del Hato, near a lumber rd. leaving Colima hwy 7 mi SSW of Tecalitlán & extending SE 3 mi toward San Isidro, 1530 m, 14 Aug 1957, McVaugh, Michel, & McVaugh 16191 (MICH). MICH/OAGAN: La Toveria, solargileuse, 900 m, 7 Sep 1898, Langlassé 331 (F,G); Barroloso, Coalcomán, 1400 m, 8 Aug 1939, Hinton 15073 (GH,NY,US,W). MEXICO: Dist. Temascaltepec: San Lucas, 24 Oct 1935, Hinton 3597 (M); Nanchititla, 14 Aug 1933, Hinton 4523 (G,MO,US); l.c., 13 Dec 1933, Hinton 5334 (BM,F,G-2 sh.,GH,MO,NY). GUERRERO: Taxco, Jul 1930, Lyonnet 726 (A,MICH,MO,NY); Aguazarca Filo, 30 Jun 1937, Hinton 10478 (MICH,NY,US). OAXACA: San Dionicio, 1834, Andrieux 463 (G); Comaltepeque, 4000 ft, Jun 1840, Galeotti 3232 (Syntype of synonym C. multiflora: BR-2 sh.,F-2 sh.,frag.,G); Talea, 1849, 3000 ft, Galeotti 3451 (MICH); Cerro de San Felipe, 1800 m, 15 Aug 1897, Conzatti & Gonzalez 375 (GH); l.c., 1900 m, 12 Sep 1897, Conzatti & Gonzalez 566 (GH); l.c., 7000 ft, 23 Sep 1895, Conzatti 713 (GH); 6 mi NW El Coyula by Mexico 190, 5000 ft, 2 Aug 1965, Kral 25302 (MICH,MO). VERA CRUZ: Mirador, Cordillera, Jun-Oct 1840, Galeotti 3290 (Syntype of synonym C. multiflora: BR); vic of d'Orizaba, Jul 1866, Bourgeau s.n. (P); La Florida, Mun. Atzalán, 1700 m, 6 Jul 1970, Ventura 1527 (F, MICH,MO,US). CHIPAS: mts near Hacienda Monserrate, Jun 1923, Purpus 10561 (M,NY,UC); Nuevo Amatenango, 1300 m, 17 Jul 1941, Matuda

Figure 78. Central American distribution of three species of section Mexicana. Clitoria monticola (▲); C. polystachya var. polystachya (●), var. congesta (◐); C. triflora (★).



4771 (GH,MICH,MO,NY); mun. of Zinacontan, 5500 ft, 7 Jul 1966,  
Laughlin 1201 (F,US).

G U A T E M A L A. near Chinanta, Jul 1860, Hayes s.n. (GH.  
HUEHUETENANGO: Cerro Victoria, across river from Finca San Rafael,  
Sierra de los Cuchumatanes, 800 m, 27 Jul 1942, Steyermark 49577 (F,  
US). SOLOLA: Volcán San Pedro, N facing slope towards Lago de  
Atitlán, 1800-3200 m, 7 Jun 1942, Steyermark 47200 (F,NY,US).  
CHIQUMULA: Cerro Brujo, vic Rio Negro, below Montana Montenegro,  
1500-2000 m, 1 Nov 1939, Steyermark 30925 (F). ZACAPA: Sierra de las  
Minca, near summit of ridge below Finca Alejandria, 1700-2000 m,  
12 Oct 1939, Steyermark 29756 (F); along Rillito del Volcan Monas,  
1150-2100 m, 10 Jan 1942, Steyermark 42423 (F).

H O N D U R A S. MORAZAN: San Antonio, 900 m, 3 Nov 1943,  
Rodríguez 1465 (F); near l.c., 1000 m, 17 Jun 1947, Molina 334 (F,GH);  
l.c., rd. Valle de Angeles, 1200 m, 25 Jul 1947, Molina 387 (F).  
EL PARAISO: drainage Rio Yequare, ca 6 km N of Manzaigua, 87°W-14°N,  
27 Aug 1951, Williams 18260 (F,GH,US); Colinas racosas de Quebrada,  
El Muro, 650 m, 28 Nov 1948, Molina 2803 (US).

N I C A R A G U A. MATAGALPA: Finca Sta. María de Ostuma,  
Cordillera Central, 1400 m, 18 Jan 1965, Williams et al. 28005 (F).

C O S T A R I C A. SAN JOSE: along rd. from Frailes to Tarvaca,  
1400 m, 30 Jul 1967, Lent 1164 (F,GH,NY,US).

P A N A M A. CHIRIQUI: Boquete, 5000 ft, 26 Jun 1938, Davidson  
784 (Holotype of synonym C. velutina: F 934654. Isotypes: A,MO  
1172499).

35b. Clitoria polystachya Benth. var. pringlei Fantz, var. nov.

Leaflet base rotund. Stipules 7-10 mm. Inflorescence bearing flowers loosely arranged, separated. Calyx tube 9-11 mm long, lobes 3-4 mm. Bracteoles 6-8 mm.

TYPE COLLECTION: MEXICO. Morelos: Barranca near Cuernavaca, 4 Aug 1896, Pringle 7253 (HOLOTYPE: GH. Isotype: MICH).

This variety has intermediate characteristics between the typical variety and var. congesta. The inflorescence has loosely arranged flowers and a longer calyx tube and lobes. The Gray Herbarium specimen has more mature flowers, but the inflorescences are short, not elongated as in the typical variety. However, they do agree with other specimens of var. polystachya in which some inflorescences are more juvenile, and have not yet elongated. Inflorescences and flowers of the Michigan specimen are immature. The flowers are not congested as in var. congesta which also has elongated stipules and bracteoles.

DISTRIBUTION (Figure 78): This variety is known only from the type collection.

35c. Clitoria polystachya Benth. var. congesta Fantz, var. nov.

Leaflet base rotund to weakly retuse or subcordate. Stipules 6-12 mm. Inflorescence contracted, 1-3 cm; flowers congested near the penduncle apex, pedicels appearing to be nearly fascicled. Peduncle 1-2 cm. Calyx tube 7-9 mm long, lobes 2-3 mm. Bracteoles 6-9 mm.

TYPE COLLECTION: MEXICO. Mexico: Dist. Temascaltepec, Rincón, 1960 m, 21 Aug 1933, Hinton 4447 (HOLOTYPE: NY. Isotype: GH).

This variety is easy to recognize by the globular cluster of congested flowers on the contracted inflorescences, as represented by the holotype. Inflorescences are usually shorter than the petiole. The plant has an ornamental quality, but is not known as a cultivar. Hinton 8597 is the only collection of this variety that has fruits present (from both cleistogamous and chasmogamous flowers), and is designated as the paratypic collection.

DISTRIBUTION (Figure 78): This variety is endemic to oak forests of the Temascaltepec District in Mexico, Mexico.

M E X I C O. MEXICO, Dist. Temascaltepec: Rincón, 3 Sep 1932, Hinton 1528 (BM,G); l.c., 17 Aug 1936, Hinton 8001 (GH,MICH,NY,UC); San Lucas, 1 Aug 1934, Hinton 6377 (GH,MICH,NY,UC); l.c., 24 Oct 1935, Hinton 8597 (PARATYPES: F 1497429, G-285 but not including vine around plant, MO 1800932, NY,S,US 1979941,W 13453); Cerro Muñeca, 2300 m, 17 Aug 1932, Hinton 1371 (BM-mixed,K,NY); Tejupilaco, 31 Jul 1935, Hinton 8125 (GH,K).

36. Clitoria monticola Brandegees, Univ. Calif. Pub. Bot. 6: 500. 1919.

Small shrub or subshrub, 30-60 cm tall, aerial stems erect from horizontal, subterranean xylopodium. Stems branched near base, unbranched above, longitudinally striated, 1.5-3 mm diameter, pith minutely hollow, juvenile stems angular becoming subterete with age, inconspicuously uncinat-pubescent with moderate, appressed to subappressed, 1 mm long trichomes, becoming glabrous with age. Xylopodium rarely collected, lignose, to 7 mm diameter, 4+ ? cm long.

Leaves 3-foliate, petiolate, leaflets oblong-lanceolate to oblong-ovate, tapered above middle to apex, acute, mucronate, base rotund, midrib weakly raised above, primary nerves of 7-9 pair, upper surface dark green, dull, pubescence uncinata, lower surface pale green, pubescence moderate, pilose, trichomes, 0.5-1 mm long, more prominent along nerves, lamina 5-10 cm long, 1.5-3.5 cm wide; terminal leaflet typically larger than lateral leaflets. Petioles subquadrangular, longitudinally striated, 3-6 cm long, pubescence appressed; rachis 1-1.5 (2.5) cm. Petiolules subquadrangular, rugose, 2-4 mm long, pubescence spreading. Stipules persistent, lanceolate, acute to short-acuminate, more or less weakly arcuate, 4-8 mm long, 1-2 mm wide, pubescence scattered, appressed; stipels linear to narrowly lanceolate, acute, 2-7 mm long, 0.5-1 mm wide; lateral stipels longer and prominently midnerved with less pronounced pair of lateral nerves, terminal stipel shorter and with inconspicuous nerves. Inflorescence axillary and terminal, solitary or occasionally paired, racemose, (2-) 4- to 8-flowered; axis elongated, 3-10 cm, flowers separated, loosely arranged, bearing chasmogamous or cleistogamous flowers, pubescence subappressed; peduncle 1.5-4 cm, rachis internodes 3-14 mm. Pedicels 2-3 (5) mm long, pubescence uncinata with a few 1 mm long trichomes. Bracts linear-lanceolate, acute, 3- or 5-nerved, 3-5 mm long, pubescence spreading; inner bract caducous, middle pair persistent, outer bract semipersistent. CHASMOGAMOUS FLOWERS: Bracteoles linear-lanceolate, acute, (4) 5-7 mm long, 1 mm wide, pubescence spreading, insertion of bracteoles to 1 mm below calyx. Calyx pubescence sparse, seemingly glabrate, uncinata and a few, subappressed trichomes, tube prominently 5-nerved, one nerve into each lobe, less prominently with five nerves,

each leading to a sinus, tube 9-12 mm long, 1.5-2 mm wide near base expanding to 3-5 mm wide at throat, lobes deltoid-ovate, acuminate, 1-nerved to weakly 3-nerved, 3-4 mm long, ca 2 mm wide near base, ventral lobe 4-6 mm. Vexillum small, 2.7-3.2 cm, white with purple spots (teste Hammerly), claw 5-7 mm. Alae extended beyond carina 2-4 mm, blade 8-11 mm long, 2-4 mm wide, claw 10-14 mm. Carina 5-7 mm long, 2-3 mm wide, claw 15-17 mm. Staminal tube ca 19 mm long, free filaments 2-3 mm; anthers ovate, ca 0.7-0.8 mm long, 0.5 mm wide. Gynophore 3-5 mm; ovary 7-8 mm long, 0.7-0.8 mm wide, pubescence uncinata; style 10-11 mm long, geniculate 4-5 mm from distal end; stigma capitate, ca 0.5 mm diameter; ovules 3-5 (teste Brandegee). Legume stipitate, valves convex, weakly depressed between seeds, ecostate, 4-4.5 cm long, 5-7 mm wide, glabrate; stipe short, enclosed within calyx, 5-6 mm. Seeds black, cuboidal, viscid, slightly wider than long, 3-4 mm long, 4-5 mm wide, 3 mm thick; 3-6 seeds per pod; hilum ca 1 x 1 mm. CLEISTOGAMOUS FLOWERS: Bracteoles 3-4 mm. Calyx tube 4-5 mm long, lobes 1.5-2 mm. Staminal tube elongate, 4-5 mm, free filaments 0.5-1 mm. Style ca 4 mm. Legume similar to those from chasmogamous flowers, shorter, 2.5-4 cm long. Seeds 3-4 per pod. Figure 79.

Brandegee's Clitoria is characterized as a shrub of Baja California with axillary, few-flowered racemes bearing small white flowers or ecostate, glabrous fruits that are weakly depressed between the seeds, and 3-foliate leaves.

PHENOLOGY: The few collections of this species have been made from mid-September to mid-October. Both chasmogamous and cleistogamous flowers and fruits were collected during this period.



Figure 79. Clitoria monticola. (a) juvenile branch, x 1; (b) leaflet, x 1; (c) inflorescence, x 1; (d) flower, x 1; (e) calyx, x 1; (f) vexillum, x 1; (g) ala and carina, x 1; (h) androecium, x 1; (i) anther, x 6; (j) gynoecium, x 1; (k) stigma and style apex, x 8; (l) juvenile fruit, x 1; (m) dehiscent fruit, x 1; (n) three views of seed, x 1. (Hammerly 332, GH: a,c-d. Brandegee s.n., UC 83907: e-k. Brandegee 156, UC 83956: b,l-n.)



TYPE COLLECTION: MEXICO. Baja California: El Taste, 14 Sep 1893, Brandeggee s.n. (HOLOTYPE: UC 83907).

Brandeggee cited two localities from which he had collected the species. Four specimens in his herbarium are now deposited at the University of California. One specimen bears the accession number cited by Brandeggee as the type specimen, and is the holotype. The other three collections are paratypes.

All four type specimens were originally identified as C. mariana L. Clitoria monticola is easily distinguished from C. mariana by the smaller, white flowers, several-flowered inflorescences, smaller calyx lobes, short stipitate fruits, and diadelphous stamens in the cleistogamous flowers. Clitoria monticola has close affinities with C. polystachya but is distinguished by the glabrate fruit, uncinatopubescent ovary, few-flowered, racemose inflorescences, and narrower leaflets.

DISTRIBUTION (Figure 78): This species is endemic to Baja California found on dry mountain slopes of oak and lower pine forests.

M E X I C O. BAJA CALIFORNIA: El Taste, 11 Sep 1893, Brandeggee s.n. (PARATYPE: UC 84975); Sierra de San Francisquito, 18 Oct 1890, Brandeggee 156 (PARATYPES: UC 83956 & 84976); midway on Seirra Laguna, ca 4500 ft, 13 Oct 1941, Hammerly 332 (GH).

37. Clitoria triflora Watson, Proc. Amer. Acad. 22: 407. 1887.

Subshrub to suffrutescent, erect, 30-70 cm tall. Stems erect, unbranched except near the base, weakly longitudinally striated, pubescence conspicuous, moderate to dense, trichomes spreading to

suberect, ca 0.5-1 mm long. Leaves 3-foliate, petiolate, thick chartaceous, petiolate, leaflets oblong to lanceolate-oblong, apex obtuse or acute and slightly tapered below apex, base rotund or retuse, midrib above weakly raised, primary nerves of 7-9 pair, upper surface dark green, dull, pubescence uncinata, lower surface green, pubescence sparse to glabrate, trichomes spreading to suberect, confined mainly to nerves, lamina 5-10 cm long, 1.5-2 (3) cm wide; terminal leaflet typically longer than lateral leaflets. Petioles subquadrangular, with nearly smooth surface or raised longitudinal ridges and alternatingly caniculate, pubescence moderate, trichomes uncinata and suberect to subappressed, typically length 2.5-5 (7) cm; rachis 1-1.5 (2) cm. Petiolules subquadrangular, dark, 2-3 mm, pubescence of moderate to dense, uncinata trichomes with scattered, spreading to subappressed trichomes. Stipules linear, more or less arcuate, acute, weakly striated, 7-11 (14) mm long, 1-1.7 mm wide; stipels linear to subulate, acute, terminal stipels 2-5 (6.5) mm long, 0.2-0.4 mm wide, lateral stipels 6-11 mm long, 0.4-0.7 mm wide. Inflorescence axillary, solitary, racemose or occasionally paniculate, (2-) 3- to 8-flowered; axis elongate, 3-13 cm, pubescence uncinata covered by moderate, subappressed trichomes; peduncle 1.5-6.5 cm; rachis internodes 2-12 mm. Pedicels 5-7 (9) mm. Bracts lanceolate, acute, 5- or 7-nerved on inner face, outer face with nerves inconspicuous except for midrib, middle pair and outer bract persistent, 4-6 mm long, 0.8-1.2 mm wide. Flowers chasmogamous, cleistogamous flowers unknown. CHASMOGAMOUS FLOWERS: Bracteoles linear-lanceolate, acute, pubescence of uncinata and spreading trichomes, (6) 7-9 mm long, 0.8-1.2 mm wide, inserted 1-2 (4) mm below the calyx. Calyx pubescence uncinata beneath conspicuous, 0.5-1 mm

long, subappressed trichomes, tube dark-colored, 5- (10-) nerved, nerves more or less conspicuous, 7-9 mm long, 2-3 mm wide at base expanding to 4-5 mm at throat, lobes ovate, long-acuminate, 4-5 mm long, ventral lobe 5-7 mm. Vexillum small, 2.5-3 cm long, 1.5-2 cm wide, dark purple to lilac (teste Standley, 1922) becoming pale yellow to orange in dried state with a dark center, claw 8-9 mm. Alae extended beyond carina 3-4 mm, blade 7-10 mm long, 3-5 mm wide, claw 10-14 mm. Carnia 6-8 mm long, 2-4 mm wide, claw 12-16 mm. Staminal tube 16-18 mm long, vexillary stamen coherent near middle, free filaments 1-3 mm; anthers ovate, 1-1.5 mm long, 0.5-0.8 mm wide. Gynophore 3-4 mm; ovary 7 mm long, 1 mm wide, pubescence densely uncinata with whitish, appressed, 1 mm trichomes along vexillary suture; style 12-14 mm long, geniculate 4-5 mm from distal end; stigma capitate, minute bearded at base, ca 0.5 mm diameter. Legume stipitate, valves convex, weakly depressed between seeds, ecostate, (2.5) 3.5-5 cm long, 7-9 mm wide, glabrous to scattered uncinata pubescent; stipe 4-8 mm; beak 2-4 mm; dehiscence causing valve to twist one to one and one-fourth turns. Seeds black to dark brown, cuboidal, viscid, face weakly subreniform, 3.5-4.5 mm long, 5-6 mm wide, 3 mm thick, (2) 4-6 seeds per pod; helum ca 1 x 1 mm. CLEISTOGAMOUS FLOWERS unknown, or lacking. Figure 80.

Watson's Clitoria is characterized as a subshrub with narrow, elongated, oblong leaflets, racemose inflorescences of small, purplish flowers, and ecostate fruits that are weakly depressed between the seeds.

PHENOLOGY: Flowers and fruits have been collected from July through September, with one collection of October 2nd bearing fruits.

TYPE COLLECTION: MEXICO. Jalisco: Rio Blanco, Jul 1886, Palmer 159 (LECTOTYPE: GH. Isolectotypes: BM,G-hb. Barbey-Boisser, NY-2 sh., PH,US 1364017).

Figure 80. Clitoria triflora. (a) habit, x 1; (b) leaflet, x 1; (c) inflorescence, x 1; (d) flower, x 1; (e) calyx, x 1; (f) vexillum, x 1; (g) ala and carina, x 1; (h) androecium, x 1; (i) anther, x 7; (j) gynoecium, x 1; (k) stigma and style apex, x 8; (l-m) legume, x 1; (n) three views of seed, x 1. (Palmer 159, GH: a; BM: m-n. Pringle 4450, F 264339: b-c; G-hb. Barbey-Boisser: d-k. Rose & Painter 7521, US 451129: l.)



Watson cited one collection when he published C. triflora, but did not designate where the type was deposited. The Gray Herbarium specimen is selected as the lectotype from the syntypes examined because it contains the structures described by Watson, and more closely agrees with his description.

NOTES: Clitoria triflora is rarely confused with other species by botanists. Its affinities lie with C. monticola and C. polystachya and can be distinguished by the purplish flowers, conspicuous spreading pubescence on the stem, and the narrow oblong leaflets which are nearly glabrous below. Superficially, C. triflora bears a resemblance to C. guianensis from which it is easily distinguished by the smaller flowers and the ecostate fruits which are weakly depressed between the seeds.

Dried specimens of C. triflora frequently have the leaflets in the complicate position. Flowers lack the purplish coloration reported by Standley (1922), but dry to a pale yellow or orangish color. The center is dark, purplish. Field data are sparse on this species. From the specimens examined, none of the collectors noted the flower color.

DISTRIBUTION (Figure 78): Clitoria triflora is an endemic of rocky mountain slopes in southwestern Mexico, growing in the oak zone at altitudes near 5000 ft.

M E X I C O: GUANAJUATO: Dolores-Hidalgo-Guanajuato Rd., 15 Aug 1947, Kenoyer 2100 (GH). JALISCO: near Guadalajara, Jul 1894, Pringle 4450 (BM,E,F,G-3 sh.,GH,M,MICH,MO,NY,PH,S,UC,W); l.c., 5000 ft, 12 Aug 1902, Pringle 9735 (F,GH,LA,MICH,MO,NY); l.c., 30 Sep 1903, Rose & Painter 7453 (US); near Etzatlán, 2 Oct 1903, Rose & Painter 7521 (US). MICHOCAN: Vers Huerta, vic. Morelia, 1950 m, 1 Sep 1910, Arsene 7013 (US).



38. Clitoria mexicana Link, Enum. Hort. Berol. 2: 233, no. 2711.

1822.

- Clitoria mariana Schlecht. ex Benth., Ann. Wein, Mus. 2: 115.

1837; pro syn.

A slender vine, suffrutescent, trailing to sprawling along ground or climbing, to 2 m long. Stems herbaceous becoming lignose, more or less twining, 1-2 mm thick above to 5-7 mm thick below, pith minutely hollow, infrequently branched above, longitudinally striated, pubescence uncinata with suberect, 0.5-1 mm trichomes, becoming subappressed, then glabrate. Xylopodia rarely collected, subterranean, lignose, 3-7 mm diameter, to 35 cm or more (?) long, rarely branched, apex knobby, to 2.5 cm across, bearing several aerial stems. Leaves 3-foliate, chartaceous, petiolate, leaflets as juvenile ovate to cordiform, becoming ovate, lanceolate, ovate-oblong or lanceolate-oblong, apex acute, short-acuminate, mucronate, base rotund to subcordate, midrib weakly raised above, primary nerves of 6-9 pair, upper surface dark green, dull, glabrous or sparsely uncinata-pubescent, lower surface pale, glaucescent, sparsely pilose to glabrate, trichomes confined mainly to nerves, lamina 3-8 (10) cm long, (1.5) 2.5-4 cm wide. Petioles longitudinally striated-caniculate, (1.5) 2.5-6 cm, pubescence uncinata and pilose to glabrate; rachis 1-2 cm. Petiolules dark, rugose, 2-4 mm, pubescence uncinata and pilose to glabrate. Stipules lanceolate to lanceolate-oblong, acute, (5) 6-9 mm long, 2-3 mm wide, pubescence uncinata, more or less ciliate; stipels linear, pubescence uncinata and ciliate, lateral stipels prominent, 3- or 5-nerved, 5-9 mm long, 0.4-0.7 mm wide, terminal stipels 3-6 mm long, 0.3-0.5 mm wide.

Inflorescence axillary, solitary, racemose, 2- to 4- (6-) flowered, bearing chasmogamous or cleistogamous flowers, 2-8 (11) cm long, axis pubescence uncinata and short pilose above, glabrate below; peduncle 2-7 cm; rachis internodes 3-14 mm. Pedicels paired, 3-6 mm. Bracts lanceolate, acute, sparsely uncinata-pubescent to glabrate, ciliate, inner bract ovate, caducous, 1.5-2 mm long, 1-1.5 mm wide, middle pair persistent, lanceolate, 3-5 mm long, 1.5-2 mm wide, outer bract deciduous, narrow lanceolate, 2-3 mm long, 1 mm wide. CHASMOGAMOUS FLOWERS: Bracteoles linear, acute, 5-9 mm long, 1-1.5 mm wide. Calyx pubescence uncinata with sparse, subappressed, to spreading trichomes to glabrate, tube purplish, 5- (10-) nerved, nerves leading to sinus less conspicuous, tube (8) 9-12 mm long, 2-4 mm wide at base expanding to 4-6 mm wide at throat, lobes deltoid, ovate, rapidly narrowed to long acumens ca half the lobe length, lobes (5) 6-8 mm long, 2-3 mm wide at base, ventral lobe ovate at base, acumens ca two-thirds the lobe length, 7-10 mm long, 1 mm wide. Vexillum small, 3-4 cm long, 1.5-2 cm wide, white with lilac-purplish veins and center, glabrate outside, claw 4-5 mm, blade decurrent. Alae extended beyond carina 4-6 mm, blade 13-16 mm long, 4-5 mm wide, claw 8-10 mm. Carina 7-8 mm long, 2-3 mm wide, claw 13-16 mm. Gynophore 3-4 mm; ovary ecostate, 6-7 mm long, 0.7-1 mm wide; densely uncinata-pubescent; style 11-15 mm long, geniculate 4-5 mm from distal end; stigma capitate, 0.5-0.8 mm diameter. Staminal tube 15-19 mm long, vexillary stamen coherent near middle, free filaments 1-2 mm; anthers ovate, 1-1.3 mm long, 0.5-0.6 mm wide.

Legume stipitate, valves convex, ecostate, conspicuously depressed between seeds, glabrous, (2.5) 3-5 cm long, 6-7 mm wide; stipe 4-8 mm; beak 2-4 mm; dehiscence causing valve to twist 1-1.5 turns. Seeds dark

brown to black, viscid, cuboidal, face subreniform, 3-4 mm long, 4-5 mm wide, 3 mm thick, 4-8 seeds per pod; hilum 1 x 1 mm. CLEISTOGAMOUS FLOWERS: Bracteoles linear, 3-5 mm long, Calyx tube 4-7 (8) mm long, 1.5-2 mm wide, pubescence uncinata and sparsely pilose, lobes 2-4 mm long. Petals 2-5, translucent, enclosed entirely within calyx, blades ca 1 x 0.3 mm, subsessile to 1 mm claw. Staminal tube elongate, 4-5 mm, free filaments 1-1.5 mm. Gynophore 1 mm; ovary 5 mm long, 0.7-1 mm, ecostate, pubescence densely uncinata; style 3-5 mm. Legume similar to those from chasmogamous fruits, short, (1.5) 2.5-4 cm long. Figure 81.

Link's Clitoria is characterized as a vine with small, white flowers and ecostate fruits that are conspicuously depressed between the seeds.

PHENOLOGY: Chasmogamous flowers have been collected from July to November, with fruits prominent from October to December. Cleistogamous flowers and fruits are present from October through January, with one collection in early March (7th).

TYPE COLLECTION: MEXICO. Guerrero: San Antonio Buenos Aires, Dist. Montes de Oca., 14 Dec 1937, Hinton 11668 (NEOTYPE: NY. Isoneotypes: G-262, MICH, S, UC, MO 97761, W 11241).

Link did not cite collections when he published C. mexicana. The type was a cultivar at Berlin. Stafleu (1967) noted that Link's types were deposited mainly at Berlin, whose legume collection was destroyed during World War II. The description published was short, and could fit generally several Clitoria species, including this one. A decade after Link, Don (1832) included C. mexicana in his treatment and reported the climbing habit and linear bracteoles characteristic of this species, but not mentioned by Link. Another early pair of botanists, Martius

Figure 81. Clitoria mexicana. (a) habit, x 1; (b) inflorescence, x 1; (c) flower, x 1; (d) calyx, x 1; (e) vexillum, x 1; (f) ala and style, x 7; (g) androecium, x 1; (h) gynoecium, x 1; (i) stigma and style, x 7; (j-k) legumes, x 1; (l) three views of seed, x 1. (Breedlove 12025, F 1666447: a. Hinton 11668, NY: b-c, j. Molina 18472, NY: d-i. Tucker 784, UC M000575: k-l.)



and Galeotti (1843) reported C. mexicana from Oaxaca, Mexico, citing Galeotti 3176 (G!) which agrees with the Link description and this species. Link noted that his C. mexicana had affinities with C. mariana. This is the only Mexican species which is superficially similar to C. mariana. Historically, these two species have been confused with each other, and combined together under one recognized name (e.g., Bentham, 1858) and resegreated (e.g., Rose, 1899). Clitoria mariana appears to be the only other species that could possibly agree with Link's species, but it has larger flowers than Link described (nearly double the size), and Link considered his species as distinct from C. mariana. This species is the only one, except for C. mariana, with which Link's name has ever been associated. Despite the inadequate description and lack of a type, historical evidence attributes Link's name to this species.

With the lack of any known type specimen, a neotype was selected. Mexican specimens were given highest priority. Of these, Hinton 11668 is one of two collections examined that contain both fruit and flowers, both structures described by Link. Only the New York specimen had fruits, and thus it is selected as the neotype. The other collection, Liebermann 5128, had scanty material, and was eliminated from consideration. The neotypic collection is a good representative collection of the species.

Bentham (1837) cited "C. mariana Schlecht. Linnaea 5 p. 178" in synonymy with C. mexicana Link. First, Bentham made an orthographic error of p. 178 for p. 578 (Schlechtendal, 1830). Page 178 refers to plants from St. Thomas, p. 578 to those from Mexico. Second, Schlechtendal did not describe a new species, but attributed C. mariana

to Linnaeus. However, Schlechtendal had misidentified the specimens (Schlede & Deppe 606, HAL-3 sheets!) as C. mariana L., instead of correctly identifying them as C. mexicana Link. Bentham was correct to include Schlechtendal's specimens under C. mexicana, but the name published in synonymy by Bentham, C. mariana Schlecht. ex Benth., is illegitimate since it was published in synonymy. Bentham (1858) combined C. mariana L. with C. mexicana Link, instead of treating them as segregate species as he had done in the past. No reason was given by Bentham, and Schlechtendal's treatment was not cited. This treatment agrees with Rose (1899) and others that C. mexicana Link is distinct from C. mariana L. Clitoria mexicana is easily distinguished by the smaller, white flowers, short stipitate fruits, and elongate staminal tubes in the cleistogamous flowers.

VERNACULAR NAMES: HONDURAS: Frijolillo, Standley et al. 923.

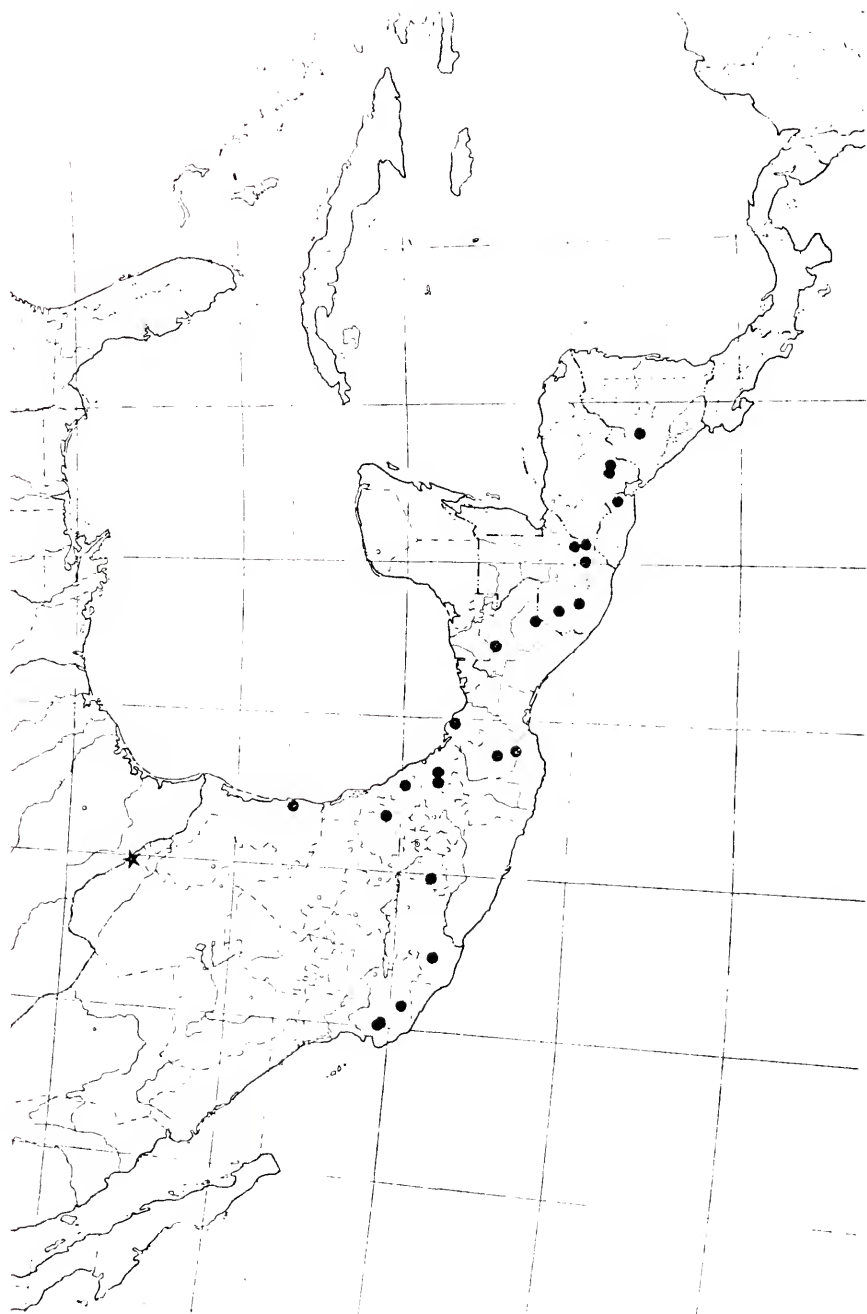
ECONOMIC IMPORTANCE: This species has been cultivated in European gardens on a limited basis for its climbing habit.

NOTES: Clitoria mexicana has its affinities with C. polystachya, C. monticola, and C. triflora, and is easily distinguished by its viney habit, fewer flowers per inflorescence, longer calyx lobes, and fruits with more conspicuous depressions between the seeds.

DISTRIBUTION (Figure 82): Clitoria mexicana is found on dry, rocky mountain slopes from Central Mexico to Honduras, with an isolated collection from northern Mexico and another one from Nicaragua. It is found frequently in open areas of pine forests, at elevations of 800-2000 m. McVaugh 17883 noted the species in the cloud forest; McVaugh 13988 and 14300 report the species on west and south-facing slopes; and McVaugh 20416 reported the plants growing on a red clay soil.

Figure 82. Central American distribution of two species of section Mexicana. Clitoria humilus (★); C. mexicana (●).





M E X I C O. Shaffner s.n. (P); environ d'Arumbara, Sep 1842,  
Ghiesbracht s.n. (P). TAMAULIPAS: Sierra de Tamaulipas, Las Yucas ca  
 40km NNW of Aldama, 23°14'N-98°10'W, 14 Oct 1957, Dressler 2410 (GH,  
 MICH,MO,UC-2 sh.). MEXICO: Nanchititla, Temascaltepec Dest., 7 Oct  
 1933, Hinton 4968 (BM,G-2 sh.,GH); Conda de Nanchititla, 1800 m 26 Oct  
 1969, Matuda 37703 (US). JALISCO: Sierra de Manantlán, 15-20 mi SE  
 Autlán on bajada S & W of divide between Asenadero San Miquel Uno &  
 Durazno, 1700 m, 7 Nov 1952, McVaugh & Sooby 13988 (MICH,US); Sierra de  
 Cuale, SW of Talpa de Allende, SW of peak Piedra Rajada, 1800-2250 m,  
 19-21 Nov 1952, McVaugh & Sooby 14300 (MICH,US); 11-12 mi S of Talpa de  
 Allende, headwaters of W branch of Rio de Talpa, 1200-1700 m, 23-25 Nov  
 1960, McVaugh, Feddema, & Pippen 21367 (MICH). MICH/OACAN: Cerritas de  
 Agua ca 3 mi below lumber camp at Las Aguas, W of Aguililla, 18°45'N-  
 102°56'W, 2000-2100 m, 15 Sep 1958, McVaugh 17883 (MICH). OAXACA:  
 Cordilla, 3000-4000 ft, Nov-Apr 1840, Galeotti 3146 (G) and 3176 (G);  
 Mina de Dolores, Aug 1842, Liebmann 5125 (F-frag.); Fortín, 1841-43,  
Liebmann 5126 (F-frag.); Dos Puentes, Oct 1841, Liebmann 5129 (F-frag.);  
 Las Sedas, 29 Sep 1894, Pringle 5846 (GH); 12 mi E of Sta Marie  
 Alvarradas along rd to Ayutla, 6500 ft, 19 Oct 1967, Gentry 22350 (A);  
 vic Cerro Zempoaltepetl, along rd from Santo Domingo Albarradas to  
 Mitla, 25-30 km WSW of summit, 1900 m, 18 Aug 1950, Hallberg 1032 (MICH).  
 GUERRERO: Pilas Soledad, 1560 m, 23 Nov 1937, Hinton 9892 (BM,G);  
 Carrizo-Sta. Domingo, Dist. Galeana, 1400 m, 28 Oct 1939, Hinton 14732  
 (F,MICH,NY,W); Pilas Filo Mayor, Mina, 1760 m, 3 Oct 1937, Hinton 10751  
 (BM,F,G,GH,MO,NY-2 sh.,W). VERA CRUZ: 1838-39, Linden 689 (MICH);  
 region d'Orizaba, 20 Oct 1866, Bourgeau 3172 (P); near Zacualpan, 1907,  
Purpus 1903 (E); l.c., 1907, Purpus s.n. (UC); near Rancho Viejo, Nov

1931, Purpus 11180 (MICH) and 1933, 16212 (A,F); Ocotepec, mun. de Jalacingo, 1800 m, 15 Jul 1970, Ventura 1670 (NY,UMO,US); La Florida mun. de Atzalan, 4 Jul 1972, Ventura 5658 (MICH); inter Jalapam et Hautepeque vel prope San Andres, 28 Oct 1828, Schlede & Deppe 225 (HAL-3 sheets); Vallee de Cordoba, 7 Mar 1866, Bourgeau 2042 (P); Mirador, Oct 1841, Liebmann 5128 (F,S) and Nov 1841, 5128 (US-2 sh.,W); l.c., Wawra 1000 (W); l.c., Sartovius s.n. (NY); l.c., 3000-3800 ft, Sartovius 78 (W). CHIAPAS: Lago de Monto Bello, 25 mi E of Trinitaria, mun. La Trinitaria, 5200 ft, 17 Aug 1966, Breedlove 15001 (US); 4 mi N of Jitotol on rd to Pueblo Nuevo Solistahuacán, mun. Jitotol, 5500 ft, 20 Aug 1965, Breedlove 12025 (F,US,WIS).

G U A T E M A L A. Sep 1921, Tonduz 865 (GH). HUEHUETENANGO: Cerro Victoria, across river from Finca San Rafael, Sierra de los Cuchamatanes, 800 m, 27 Jul 1942, Steyermark 49595 (F). SOLOLA: SE of Pueblo San Jorge, 12 Aug 1936, Hatch & Wilson 302 (F). SANTA ROSA: Buena Vista, 5500 ft, Nov 1892, Heyde & Lux 4144 (G-3 sh.,GH,M). JALAPA: Volcán Jumay above La Laguna, 1 mi N of Jalapa, 1400-1600 m, 30 Nov 1939, Steyermark 32300, (F). CHIQUIMULA: Montaña Castilla, vic of Montaña Cebollos, along Rio Lucia saso, 3 mi SE of Quezaltepeque, 1200-1500 m, 6 Nov 1939, Steyermark 31258 (F). ZACAPA: along Rillito del Volcán de Monas, Sierra de Las Minas, 1150-2100 m, 10 Jan 1942, Steyermark 42354 (F); Sierra de las Minas, along trail between Rio Honda & summit of mt at Finca Alejandria, 1000-1500 m, 11 Oct 1939, Steyermark 29636(F).

E L S A L V A D O R. MORAZAN: Finca of General J. T. Calderón, Montes de Cacaquatique, 13°46'N-88°13'W, 13 Jan 1942, Tucker 784 (F,UC).

H O N D U R A S. MORAZAN: El Chorrito, cerro de Hule 20 km s of Tegucigalpa, 1500 m, 27 Oct 1966, Molina 18472 (F,G-2 sh.,GH,NY);

Chauite, 20 Sep 1943, Rodríguez 902 (F); slopes Cerro de Uyunca, region of El Valle Encantado, 1300-1500 m, 8 Dec 1946, Standley et al. 903 (F) and 923 (F); along and near Rio Agua Amarilla above El Zamorano, 1000-1200 m, Oct-Nov 1948, Standley 13832 (F,NY)US) & 1000-2000 m, 13912 (F,MICH,NY); drainage Rio Yequare, entre Agua Amarilla y Piedras Gordas, 1300 m, 14°N-87°W, 2 Nov 1948, Molina 1388 (F,GH); vic mt. Uyuca between El Empalme Tatumbula & Piedra Herrada, 26 km rd to Zamorano, 1500 m, 24 Oct 1966, Molina 18403 (F,G,GH,NY).

N I C A R A G U A. MATAGALPA: Jinotega Rock Quarry, ca 5 km NW of Sta. Marie de Ostuma, at junction of oak-pine forest with montane rain forest, 18 Jan 1965, Williams et al. 27964 (F).

39. Clitoria humilus Rose, Contr. Nat. Herb. 5(4): 169. 1899.

Suffrutescent herb, erect, 10-40 cm tall. Stems unbranched, 1-2 mm diameter, angular-subterete, pith minutely hollow, juvenile branches with conspicuous pilose pubescence above uncinata trichomes, becoming glabrous with age; internodes 1.5-6 cm. Leaves 3-foliate, subcoriaceous, short-petiolate, leaflets oblong, apex obtuse to retuse, mucronate, base rotund, midrib impressed, primary nerves of 7-9 pair, upper surface slightly darker green, pubescences uncinata, moderately dense to scattered, lower surface glabrate with uncinata and appressed trichomes along nerves, lamina 2-6 cm long, 0.7-1.5 cm wide. Petioles quadrangular, short, (l) ca 2.5 cm, pubescence uncinata with subappressed to spreading trichomes, becoming glabrate; rachis ca 1-1.5 cm. Petiolules 2 mm, pubescent. Stipules deltoid-lanceolate, acute, 3-6 mm long, 1 mm wide at base; stipels linear, acute 3-4 mm long, ca 0.3-0.5 mm wide.

Inflorescence axillary, solitary, subsessile, ca 0.2-0.3 cm long, 2-flowered, bearing chasmogamous flowers. Pedicels 3-4 mm. Bracts ovate, acute, 2-3 mm. CHASMOGAMOUS FLOWERS: Bracteoles linear, acute, 2-3 mm long, 1 mm wide, inserted to 1 mm below calyx, pubescence uncinata with occasional macroscopic trichomes towards apex and margins. Calyx pubescence uncinata with scattered, spreading trichomes, tube 10-nerved, a nerve extending to each lobe apex, and a nerve extending to each sinus, tube 7-8 mm long, 2-3 mm wide at base expanding to 4-5 mm, lobes ovate, acuminate, 6-7 mm long, 2-3 mm wide at base. Vexillum small, 3.5-4 cm long, ca 2 cm wide, white fading yellowish in dried state, claw ca 6 mm. Alae extended beyond carina ca 5 mm, blade ca 18 mm long, 6-7 mm wide, claw ca 11 mm. Carina ca 9 mm long, 3 mm wide, claw ca 13-14 mm. Staminal tube ca 18 mm, vexillary stamen coherent near middle, free filaments 1-2 mm; anther lanceolate, ca 1.5 mm long, 0.7 mm wide. Gynophore short, ca 3-4 mm; ovary ca 8 mm long, 0.8 mm wide, pubescence densely uncinata beneath white, appressed trichomes abundant near the vexillary margin; style ca 12 mm, geniculate 5 mm from the distal end; stigma capitate. Legume unknown. CLEISTOGAMOUS FLOWERS unknown, or lacking. Figure 83.

Rose's Clitoria is characterized as a small, erect herb with three small, oblong leaflets, and bearing small white flowers in pairs from subsessile, axillary inflorescences.

TYPE COLLECTION: MEXICO. Durango: east side of the west range of the Sierra Madre, 13 Aug 1897, Rose 2251 (not seen).

NOTES: Only one collection has been examined which appears to belong with this species. Rose's description is short, but distinct from other known Mexican species. It appears to have close affinities

Figure 83. Clitoria humilus. Habit. (Marsh 35).



with C. mexicana, but is distinguished by its erect habit and oblong leaflets. It is distinct from the erect C. triflora by larger flowers, subsessile inflorescences bearing two flowers, and smaller leaves. This species superficially resembles the less robust individuals of C. fragrans in habit and leaflet shape and size, but is distinguished by its smaller flowers, non zigzag stem, shorter inflorescences, smaller stipules, and broader leaflets.

Rose noted the flower color as yellow, a color not typical of Clitoria species in mature flowers. Species which collectors have noted as bearing white flowers (e.g., C. falcata) tend to have flowers turn yellowish with age. White flowers of the Mexican species fade to a pale yellowish in the dried state. It is presumed that Rose's species has white flowers which dried yellow, and that Rose's color description came from post-mature flowers.

DISTRIBUTION (Figure 82): This species is an endemic from Central Mexico known only from the type collection of Durango, and the following collection.

M E X I C O. COAHUILA: Muzquiz, Spring 1935, Marsh 35 (F).

40. Clitoria cordobensis Burkart, Darwiniana 5: 61. 1941.

A perennial, suffrutescent herb, erect or climbing, to 1-1.5 m long. Stems subterete, weakly angular, 1-3 mm diameter, pith solid or minutely hollow, pubescence dense, appressed, becoming glabrate, stem base nearly straight, erect to lax, apex twining, or entire stem vine-like; branches nearly lacking, borne occasionally from nodes of twining portions of stem. Xylopodium rarely collected, subcylindrical,



lignose, 4-10 mm thick, grayish, rugose, unbranched. Leaves 3-foliate, chartaceous to subcoriaceous, leaflets variable, typically elliptic to lanceolate, becoming elongated, lanceolate-oblong to oblong, apex obtuse, mucronate, base rotund to retuse, margin occasionally weakly revolute, midrib impressed, primary nerves of 6-9 pair, upper surface green, pubescence sparse, uncinata, lower surface pale (glaucous?), pubescence sparse, appressed, mainly along midrib and major nerves, lamina 5-11.5 cm long, 1.5-2.5 (4) cm wide, occasionally with lower leaves bearing leaflets 1.5-2.5 x 1 cm. Petioles angular, caniculate adaxially, 2-6 cm, pubescence sparse; rachis more or less caniculate adaxially, 0.5-1.5 cm. Petiolules pubescent, 1-3 mm. Stipules persistent, lanceolate, sparsely pubescent, acute, 6-11 (15) mm long, 1.5-2.5 mm wide; stipels persistent, linear, sparsely pubescent, 4-10 mm long, ca 0.5 mm wide. Inflorescence axillary, solitary, 2-flowered (rarely racemose, 3- or 4-flowered), subsessile, bearing chasmogamous flowers at the middle nodes and cleistogamous flowers at the lower (or lacking) and upper nodes; peduncles nearly lacking to 6 mm long, typically 2-flowered at apex. Pedicels paired, strigose, 4-6 mm. Bracts persistent, lanceolate, strigulose and ciliolate-pubescent, 4-5 mm long, 1 mm wide; inner bract caducous. CHASMOGAMOUS FLOWERS: Bracteoles persistent, lanceolate, acute, strigulose and ciliolate-pubescent, 5-8 mm long, 1-1.5 mm wide, inserted ca 0.5-1 mm below calyx. Calyx green, pubescence sparse, along nerves, tube 5-nerved, each nerve leading to lobe apex, nerves to sinus more or less inconspicuous, tube 7-10 mm long, 2-3 mm wide at base expanding to 3-5 mm at the throat, lobes ovate-deltoid, acuminate, 5-8 mm long, 2-3 mm wide at base, ventral lobe 8-12 mm. Vexillum small, blade

broadly ovate, lilac, 2.5-3 cm long, ca 1.5 cm wide, pubescence sericeous, claw 3-4 mm. Alae extended beyond carina 3-5 mm, blade oblong to slightly falcate, 13-16 mm long, 3-5 mm wide, claw 8-9 mm. Carina falcate, 8 mm long, 2-3 mm wide, claw 10-12 mm. Staminal tube nearly straight, 18-26 mm long, vexillary stamen free to nearly its base, free filaments 1-3 mm; anthers elliptic, 1-1.5 mm long, 0.7-0.9 mm wide. Gynophore 3 mm; ovary 8 mm long, 0.9 mm wide, pubescence densely uncinata with overlying, whitish, dense, 1 mm trichomes on ventral half of ovary, ovules 9-11 (teste Burkart); style 6-10 mm, geniculate 4-5 mm from distal end, beard more dense below geniculate point than above; stigma flattened-globose, 1 mm diameter, bearded near base.

CLEISTOGAMOUS FLOWERS: Pedicels sublacking to 4 mm. Bracteoles lanceolate, acute, strigulose and ciliolate-pubescent, 3-5 mm long, 0.5-1 mm wide. Calyx cylindric, tube 4-7 mm long, 1-3 mm wide, lobes 2-3 mm long, 1 mm wide. Corolla lacking or vestigial, translucent, whitish, ca 1 mm long, minutely clawed, borne at base of staminal tube. Staminal tube elongated, 3-4 mm, vexillary stamen free to nearly the base, typically 5-6 fertile stamens; anthers often detached from filament and adherent to the long trichomes of the ovary. Ovary 5-6 mm; style 5-6 mm, bent back upon the ovary, stigma in contact with anthers.

LEGUME commonly collected from cleistogamous flowers, stipitate, dark brown, straight to weakly falcate, valves weakly convex, slightly depressed between the seeds, ecostate, sutures thickened, 2.5-4.5 cm long 6-7 mm wide, pubescence uncinata to glabrous, juvenile pods occasionally bearing remnants of macroscopic trichomes from ovary; stipe (8) 10-16 mm, often arcuate to coiled three-fourths of a turn; beak 4-8 mm; dehiscence causing valve to twist one-fourth of a turn.

Seeds dark reddish-brown, globose or face weakly truncate, viscid, 3-3.5 mm long, 3-4 mm wide, 3 mm thick; hilum circular, minute.

Figure 84.

Cordoba Clitoria is characterized as a herbaceous vine with 3-foliate leaves, sessile inflorescences bearing two small, lilac flowers, and with ecostate fruits weakly depressed between the seeds.

PHENOLOGY: Chasmogamous flowers and the only collection examined of fruits from chasmogamous flowers occurred in January. Cleistogamous flowers and associated fruits occurred from November through February. Two syntypic collections noted by Burkart, but not seen during this study, bear dates of March and early April. The phenology of the species appears to be from late November through early April, with a peak in late December to early February.

TYPE COLLECTION: ARGENTINA. Cordoba: Ascochinga, 30 Jan 1938, Nicora 1774 (LECTOTYPE: SI.).

Burkart (1941) cited ten specimens under the heading "Material estudiado," giving the institution where these specimens were deposited (BA, SI, or his personal herbarium). He failed to designate a holotype or indicate which specimen was the type; therefore, there are ten syntype specimens. Nicora 1774 (SI) is here selected as the lectotype and is more representative of the species than the other syntypes examined. This specimen has several stems mounted on one sheet, with both an erect portion and a twining portion. A portion of a xylopodium is present. Both chasmogamous and cleistogamous flowers are represented.

Burkart treated Nicora and Giardelli specimens as separate collections. Both ladies collected from the lectotypic locality on the same day, and may have been together. Nicora 1775 (SI) noted on

Figure 84. Clitoria cordobensis. (a) xylopodium, x 1; (b) erect portion of stem, x 1; (c) twining portion of stem with legume, x 1; (d) leaflet, x 1; (e) inflorescence, x 1; (f) flower, x 1; (g) calyx, x 1; (h) vexillum, x 1; (i) ala and carina, x 1; (j) androecium, x 1; (k) gynoecium, x 1; (l) stigma and style apex, x 8; (m) cleistogamous flower with juvenile fruit, x 1; (n) legume of cleistogamous flower, x 1; (o) legume valve, x 1; (p) three views of seed, x 1. (Nicora 1774, SI: a. Burkart 7367, GH: d,m. Sayago 539b, SI: c,o-p. Giardella 968, GH: e-l. Giardella 967, SI: 6.)



the field label that Giardelli had a duplicate specimen. Giardelli 967 agrees in data with Nicora 1775, both as to locality data (Ascochinga, 30 Jan 1938) and in field observations (Hab. monte and flor blanca). Each collector had a second specimen placed under another number, and these two collections, Nicora 1774 and Giardelli 968, may agree with each other. The collections agree on locality data, but Nicora 1774 lacked field observations which Giardelli 968 included.

The following syntype collections, cited by Burkart, were not examined: ARGENTINA (Prov. Cordoba): Valle de los Reartes, Feb 1922, Castellanos s.n. (BA:hb. Burkart 9146); Del mismo lugar, 29 Mar 1939, Giardelli 1116 (SI) and 7 Apr 1939, Giardelli 1117 (SI); Ascochinga, 30 Jan 1938, Giardelli 968 (SI).

NOTES: Burkart noted that C. cordobensis had affinities with North American species, not with those of Brazil and Paraguay. This treatment agrees with this conclusion. Species from neighboring Paraguay and Brazil have costate fruits which are turgid and not depressed between the seeds, seeds slightly longer than wide, subsessile leaves, larger chasmogamous flowers, and a short staminal tube in cleistogamous flowers. These characteristics do not occur in C. cordobensis.

Burkart noted affinities with C. mariana, C. mexicana, and C. polystachya (cited by Burkart under its synonym C. multiflora). Clitoria polystachya is distinguished easily by its erect, non twining habit, elongate paniculate inflorescences producing several flowers, and short-stipitate fruits. Clitoria mexicana is distinguished easily by the elongated peduncles, short-stipitate fruits, and longer, purplish calyx. Clitoria mariana is distinguished easily by the larger flowers, longer calyx, and subsessile staminal tube in the cleistogamous

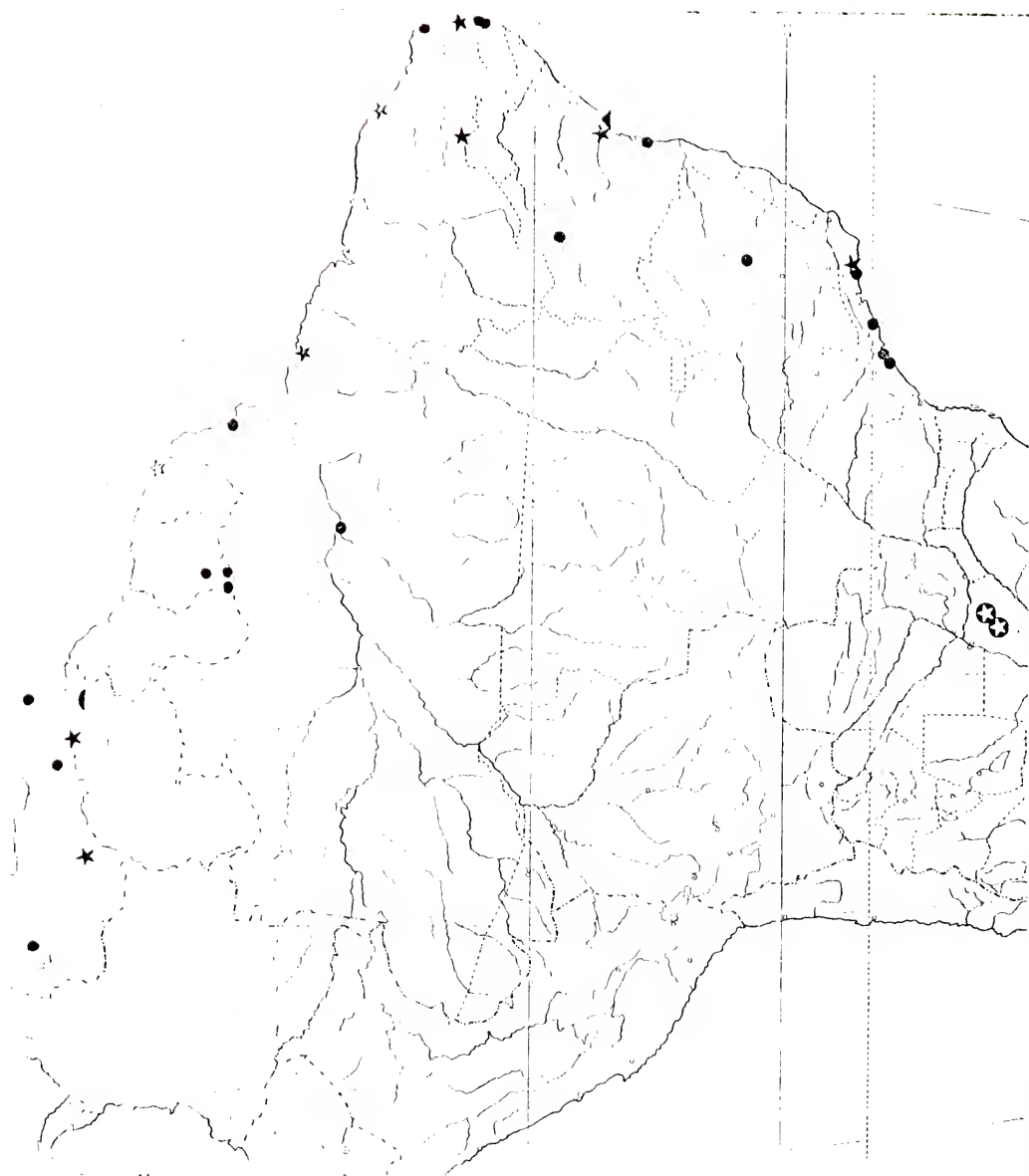
flowers. Clitoria cordobensis is very similar to C. mariana vegetatively, both species exhibiting an erect lower stem with a twining upper portion, and in several other characteristics, such as the long-stipitate fruits. Cleistogamous flowers of C. cordobensis agree more closely with those of C. mexicana, as does the size of flower, bracteoles, and other related structures. Only C. humilus has a similar sessile inflorescence, but is distinguished from C. cordobensis by its larger flowers, smaller bracteoles, and much smaller, oblong leaflets. Clitoria cordobensis appears to have much closer affinities with these three species than with C. polystachya, a more distant relative.

DISTRIBUTION (Figure 85): Clitoria cordobensis is an endemic of the Cordoba Province of Argentina, where the species is locally abundant on cultivated and wooded ground of the lower eastern slopes of the mountains of Cordoba.

A R G E N T I N A. CORDOBA: Ascochinga, 30 Jan 1938, Giardelli 967 (SYNTYPE: SI) and 968 (ISOSYNTYPE: GH); l.c., 30 Jan 1938, Nicora 1775 (SYNTYPE: SI); Sierra Chica, Estancia La Reducción, 27 Dec 1935, Burkart 7367 (SYNTYPE: SI. Isosyntype: GH, US 2340669); Rio Saco, entre V. de María & San Miquel, 3 Mar 1949, Sayago 305 (SI); Macanto, Dpto. S. Javier, Nov 1927, Castellano s.n. (SYNTYPE: BA 10561); Sierra Chinca, entre Colochuga y Quebrada de los Cóndares, Dpto. Colon, 3 Feb 1952, Hunziker 9770 (SI); Rio Pinto, "San Jorge," Dpto. Totoral, Jan 1950, Sayago 539b (SI).

Figure 85. South American distribution of *Clitoria cordobensis* (section *Mexicana*) and *Clitoria laurifolia* (section *Neurocarpum*). *C. cordobensis* (★); *C. laurifolia* f. *laurifolia* (●), f. *fasciculata* (▲), f. *imperfecta* (★), f. *petiolata* (☆), f. *parvifolia* (◐).





41. Clitoria fragrans Small, Torrey 26: 57. 1926.

Martusia fragrans (Small) Small, Manual S.E. Flora 722. 1933.

Clitoria pinetorum McFarlin, nom. in sched.

Perennial herb, erect, 15-50 cm tall, sparingly branched. Stems one to several from xylopodial crown, erect, purplish, weak to moderately zigzag above, nearly straight below, longitudinally striated, 1-2 mm thick, pith hollow, juvenile glaucous, pubescence uncinata; branches few, mostly basal. Xylopodium subterranean, horizontal, lignose, 4-10 mm thick, 5-15 cm long, with a slender distal portion gradually tapering deeper into the sandy soil, 2-5 mm thick, to 2 m (or more ?) long, bearing rootlets. Leaves 3-foliate, thick membranaceous to subcoriaceous, petiolate, leaflets of upper leaves linear, linear-lanceolate to oblong-lanceolate in the middle to lower leaves, and occasionally narrowly elliptic in the lower leaves of the stem, leaflet apex obtuse to retuse, mucronate, base rotund, midrib impressed above, primary nerves of 6-8 pair, not prominently raised, upper surface dark green, uncinata-pubescent, lower surface pale green, glaucous, glabrous, lamina 2-4.5 cm long, 0.5-1.5 cm wide. Petioles wiry, purplish, glaucescent, angular with a more or less adaxial channel, 1.5-3 (3.5) cm, pubescence uncinata; rachis 0.7-1.5 cm, similar to petiole. Petiolules dark-colored, rugose, 2 mm long, uncinata-pubescent. Stipules ovate to lanceolate-ovate, acute, 2-4 mm long, 1-2 mm wide, uncinata-pubescent; stipels linear to subulate, 1-3 mm long, 0.2-0.5 mm wide, uncinata-pubescent. Inflorescence axillary, solitary, 1- to 2- (rarely 4-) flowered, bearing chasmogamous or cleistogamous flowers, axis short, to 4 cm long; peduncle purplish, glaucescent, longitudinally

striated, 0.5-4 cm long bearing chasmogamous flowers, or 0.4-0.8 cm long bearing cleistogamous flowers. Pedicels 2-7 mm, uncinately pubescent. Bracts linear-lanceolate, acute, uncinately pubescent; inner bract minute, caducous, middle pair persistent, 2-5 mm long, 1 mm wide, outer bract deciduous, 2-4 mm. CHASMOGAMOUS FLOWERS: Bracteoles linear-lanceolate, acute, uncinately pubescent, (3) 4-5 mm long, 1 mm wide, inserted 1-2 mm below calyx. Calyx purplish-tinged near base, tube 5- (10-)nerved, nerve prominent to each lobe apex, less prominent nerve to each sinus, dichotomously forking with a branch into each adjacent lobe, tube uncinately pubescent with very scattered, 0.5 mm, appressed trichomes near calyx base and ventral edge, tube 7-10 mm long, 2-3 mm wide near base expanding to 5-6 mm wide at throat, lobes ovate, weakly 3-nerved (midnerve prominent), gradually narrowed to short-acuminate apex, 5-6 (7) mm long, 2-2.5 mm wide at base, ventral lobe 6-8 mm. Vexillum glabrate, sparsely uncinately pubescent, blade lilac, 3.5-4.5 cm long, 3-4 cm wide, claw broadly cuneate, 4-5 mm, blade slightly decurrent. Alae extended well beyond carina by 7-8 mm, blade 21-24 mm long, 4-6 mm wide, claw 13-15 mm. Carina 8-11 mm long, 3-5 mm wide, claw 14-17 mm. Staminal tube 17-22 mm, vexillary stamen coherent in lower half, free filaments 1-3 mm; anthers lanceolate, 1.2-1.5 mm long, 0.5 mm wide. Gynophore 4-5 mm, uncinately pubescent; ovary 6-7 mm long, 0.7-0.8 mm wide, pubescence dense, uncinately; style 13-17 mm, geniculate 5-7 mm from the distal end; stigma capitate, ca 0.5 mm diameter. CLEISTOGAMOUS FLOWERS: Bracteoles 2 (3) mm. Calyx tube 3-4 mm long, 1 mm wide at base expanding to 1.5 (2) mm at throat, lobes 1.5-3 mm. Corolla lacking, or rarely present, pale whitish, translucent, ca 1 mm long, 0.5 mm wide, minutely clawed. Staminal

tube nearly lacking, ca 0.1 mm. Gynophore 1-2 mm; ovary 4 mm long, 0.7 mm wide, style 5-6 mm, bent backwards and in contact with anthers. Legume long-stipitate, valves ecostate, glaucous, glabrous, conspicuously depressed between the seeds, 3-5.5 cm long (those from cleistogamous flowers are 2-4 cm long), 6-8 mm wide; stipe 15-21 mm, extended well beyond calyx (9-14 mm long on cleistogamous fruits); beak 2-4 mm; dehiscence causing valve to twist ca one-half of a turn. Seeds cuboidal, reddish-brown, viscid, 4 mm long, 4-5 (6) mm wide, 2-5 (8) seeds per legume; hilum circular, 1 x 0.5 mm. Figure 86.

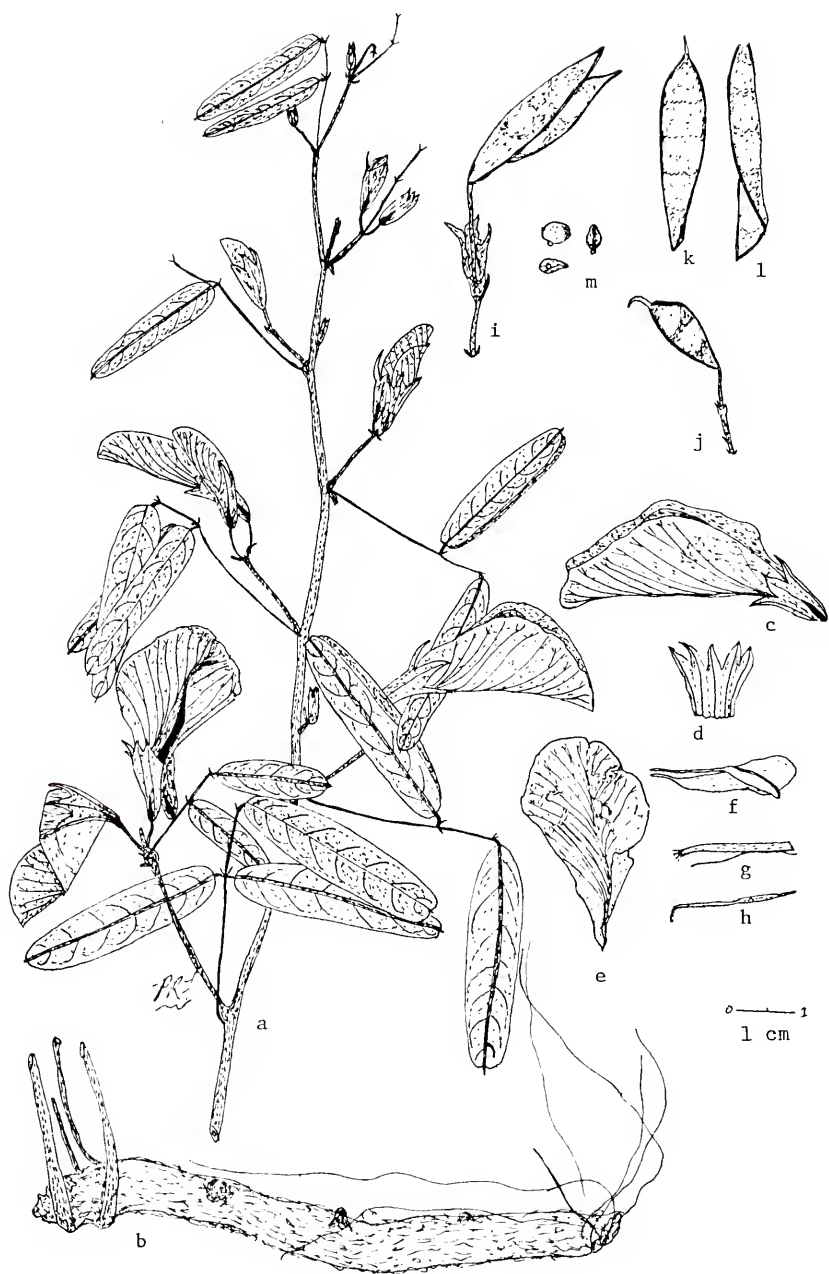
Small's Clitoria is characterized as an erect herb with purplish and glaucous axes, 2-flowered axillary inflorescences bearing medium-small, lilac flowers or long-stipitate, ecostate, glaucous fruits which are depressed between the seeds, and 3-foliate leaves with typically linear to lanceolate leaflets, dark green above and glaucous below.

PHENOLOGY: This species bears both types of flowers and fruits from May to June, with occasional cleistogamous flowers and associated fruits borne in early July through early September.

TYPE COLLECTION: UNITED STATES. FLORIDA: Highlands Co., sandhills near DeSoto City, 20 May 1925, Small & Wherry 12626 (LECTOTYPE: NY. Isolectotypes: GH,NY,UC  $\overline{M}216828$ ).

Small (1926) indicated that the type specimen was deposited at the New York Botanical Garden Herbarium. Gleason (in 1945) was unable to locate the type specimen, as indicated by his typed note on the lectotype's label. The lectotype is chosen from an isotype deposited at New York. It contained a dissected flower. The label bears the

Figure 86. *Clitoria fragrans*. (a) habit, x 1; (b) xylopodium, x 1; (c) flower, x 1; (d) calyx, x 1; (e) vexillum, x 1; (f) ala and carina, x 1; (g) androecium, x 1; (h) gynoecium, x 1; (i) legume from chasmogamous flower, x 1; (j) legume from cleistogamous flower, x 1; (k-l) legumes, x 1; (m) three views of seed, x 1. (Hood s.n., FLAS 59679: a. Small & West s.n., FLAS 14633: b. Small & Wherry 12626, NY: c-h. Ray & Lakela 11050, GH: i, l. Isely & Wemple 9340, NY: j-k, m.)



number "150" in pencil. A second isotype at New York bears the penciled number "150#8."

The locality data supplied by Small lacked the county, and was somewhat generalized as "Sandhills, Desoto City." The type locality has been located more accurately as a sandhill ridge occurring ca 3 mi north of DeSoto City via highway FLA 17A. This ridge has an east-west railroad cut made by the Atlantic Coast Line. Clitoria fragrans is found infrequently in this area, growing in semishaded to open areas in full sunlight ca 0.2 to 0.4 mi west of the junction of the railroad with the highway, upon the sandhill. The north side of the sandhill has a graveyard, an apiary site, and two concrete foundations. The latter were the remains of the R. R. station which was razed and moved to Sebring (a few miles north) according to an elderly Negro native interviewed at the graveyard. The south side of the sandhill has a small scrub woodland similar to that on the north side, both in a regrowth stage. Citrus groves in this area are slowly advancing on the scrub destroying the habitat. The type locality is more specifically noted as section 10 of the Sebring, Florida quadrangle, range 29 East, Township 35 South.

McFarlin never published his name C. pinetorum for this species. He designated two types from his personal collections: 5964 as the type for the fruits, and 5481 as the type for the flowers. Both collections are deposited with the University of Michigan Herbarium.

VERNACULAR NAME: Pigeon wings, McFarlin 5964.

NOTES: Small based the specific epithet upon the fragrance of the flowers which he noted "sometimes resembles that of the European violet, at other times that of tea-roses." This author has been unable to detect,

except very faintly, a fragrance from the chasmogamous flowers in the field. The type locality during late May and early June has a strongly, sweet-scented fragrance in the air. This fragrance emanates from the flowers of the saw-palmetto which is abundant in this area.

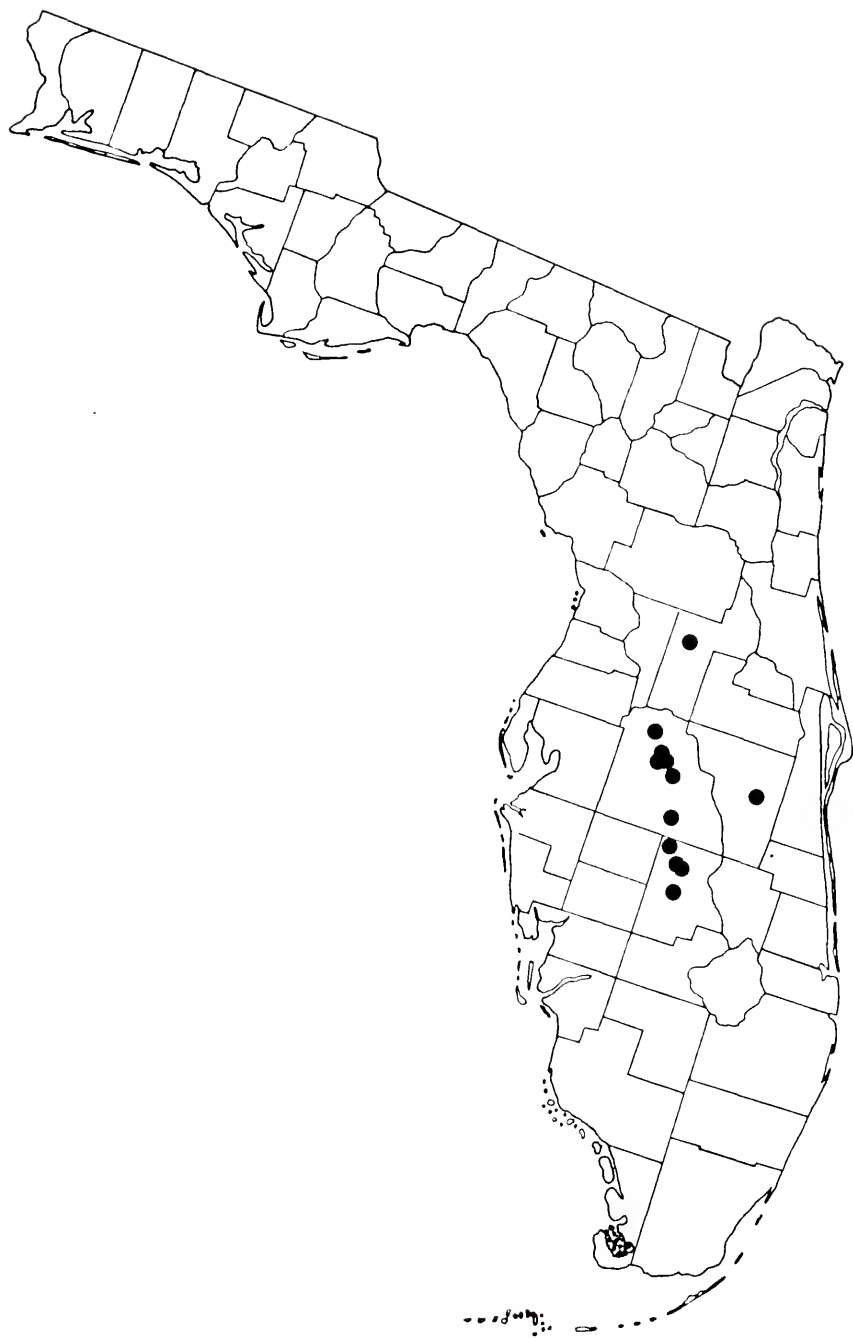
Clitoria fragrans has close affinities with C. mariana from which it is easily distinguished by its purplish-tinged and glaucous axes, non-twining habit, narrower leaflets, smaller flowers, shorter calyx tube, and long-stipitate fruits. Clitoria fragrans vegetatively resembles C. humilis, but is distinguished from that species by the longer inflorescence, smaller stipules, longer-clawed keel, slightly narrower leaflets, glaucous and purplish axes, and sessile staminal tube in cleistogamous flowers.

DISTRIBUTION (Figure 87): This species is an endemic of southern Florida, United States, primarily in Polk and Highlands Counties. Clitoria fragrans is found in secondary regrowth, sand scrubs on sandy soil. The plants are more robust in localities with some shade provided by the scrub trees (Quercus spp., Pinus spp.) but is eliminated when the undergrowth becomes more dense.

UNITED STATES - FLORIDA. HIGHLANDS: Route 8, between Childs & Lake Placid, 7 Jun 1945, Brass 15266 (FLAS,US): near Highlands Lake, 6 Jun 1931, McFarlin 5702 (FLAS); vic. Josephine Creek & US 27, S of Kuhlman, 25 Jun 1962, Ray & Lakela 11050 (GH); sandhills ca 0.3 mi W of RR crossing & Route 17A, ca 0.3 mi N of DeSoto City via FLA Route 17A, S10, T35S, R29E, 16 May 1974, Fantz 2001 (TOPOTYPE: Fantz herbarium; l.c. 26 May 1974, Fantz & Ward 2003 (TOPOTYPE: Fantz herbarium, Fantz hb., MICH); 3 mi S of Sebring, 24 May 1955, Sargent 7188 (WIS); near Sebring, 20 May 1925, Palmer 27430 (MO,UMO); Sebring,



Figure 87. Florida (United States) distribution of Clitoria fragrans,  
section Mexicana.



4 Sep 1934, Small & West s.n. (FLAS) and 5 Sep, s.n. (FLAS); above Sebring, 25 May 1935, Buswell s.n. (WIS); Avon Park, 18 May 1927, Hunnewell 10372 (GH). POLK: 11 Jun 1894, Ohlinger 87 (each mixed: F, FLAS,MO); 8 May 1928, McFarlin 1213 (FLAS); Frostproof, 30 May 1930, Bright 4127 (PENN); suburbs of Frostproof, S off US 27A, 15 Jun 1962, Lakela 25122 (GH); Lake Iris, Hesperides, 8 mi E of Lake Wales, 7 Jul 1962, Lakela 25157 (GH); Dundee, 21 May 1931, McFarlin 5481 (Syntype of synonym C. pinetorum: MICH-2 sh.); 4 mi E of Lake Hamilton via FLA 544, 15 May 1964, Conard s.n. (FLAS); 4.4 mi E of Rt. 27A via FLA 544, Lake Hamilton, 26 May 1974, Fantz & Ward 2002 (Fantz Herbarium); l.c., 24 Aug 1974, Fantz 2007 (Fantz Hb., VSC); 4.8 mi E Rt. 27A via FLA 544, Lake Hamilton, 13 Jun 1975, Fantz 2009 (Fantz Hb., LA); Winter Haven, 26 Jun 1931, McFarlin 5964 (Syntype of synonym C. pinetorum: MICH. Isosyntype: FLAS 49623); Lake Alfred, 23 Jun 1938, Bottimer 488 (US); N of Davenport, 22 May 1950, Hood 3551 (FLAS). LAKE: Leesburg, Jun 1910, Meebold 27678 (M-mixed). OSCEOLA: 12 mi S of Holopaw via US 441, 8 Sep 1964, Isley & Wemple 9340 (NY).

42. Clitoria mariana L., Sp. Pl. 2: 753, no. 4. 1753; non

Moc. & Sess. (1832) nec Schlecht. ex Benth. (1837).

Clitorius marianus trifolius subtus glaucus Petiver, Cat.

Pl. Hort. Sicc. Petiv. Appendix 3: 243, no. 55. 1704;

nom. illeg.

Clitoria foliis ternatis, calycibus oblongis Gronovius, Fl.

Virg. ed 1. 1: 83. 1739; nom. illeg.

Clitoria foliis ternatis, calycibus cylindricis L. ex Gron.,

Fl. Virg. ed. 2. 111. 1762; nom. illeg.

Vexillaria mariana (L.) Raf., Am. Monthly Mag. 268, no. 111.

1818; nom. illeg.

Nauchea mariana (L.) Desc., Mem. Soc. Linn. Proc. 4: 9.

1826; nom. illeg.

Clitoria grahamii ("Clitoria grahami") Steud. ex Benth., in

Junghuhn Pl. Jungh. 2: 252. 1852; p.p.maj.

Ternatea mariana (L.) Kuntze, Riv. Gen. Pl. 1: 210. 1891.

Clitoria lancea, nom. in sched.

Perennial suffrutescent herb, erect or trailing to climbing, to 60 cm tall or ca 1.5 m long. Stems subterete, longitudinally striated, 1-3 mm in diameter, pith minutely hollow, pubescence uncinata with moderate to scattered, subappressed to spreading trichomes, becoming glabrate, stem base erect to lax, with weakly flexuous to nearly straight internodes, upper stem portion twining, or entire stem vine-like; branches borne primarily near the base of the stem. Xylopodium rarely collected, cylindrical, lignose, subterranean in a horizontal position, 3-12 cm thick, 4-15 cm long (or more ?), distal portion slender, 1.5-6 mm thick, to 1 m long, gradually tapering deeper into earth. Leaves 3-foliate, thick membranaceous to thick chartaceous, leaflets variable, ovate, oblong-ovate, elliptic-oblong, lanceolate, ovate-lanceolate, oblong, to occasionally elliptic, apex acute to obtuse, infrequently short-acuminate, mucronate, base broadly cuneate to subcordate, midrib weakly raised above, primary nerves of 7-12 pair, upper surface dark green, uncinata-pubescent to glabrous or rarely bearing subappressed trichomes, lower surface olive to pale green, glaucescent, pubescence typically sparse, trichomes erect to spreading,

mainly confined to major nerves, or infrequently dense, subsericeous, becoming slightly scattered, lamina 2-9 (11.5) cm long, 1-4 (6.5) cm wide. Petioles subterete, longitudinally striated, often weakly to strongly caniculate adaxially, 2-10 cm, pubescence sparse to moderate, uncinata and strigose pubescent to glabrate; rachis 1-2 (2.5) cm.

Petiolules subquadrangular, pubescent, dark-colored, 3-4 mm. Stipules lanceolate to ovate-lanceolate, acute, erect to spreading, somewhat reflexed with age, uncinata-pubescent, ciliolate, 4-10 mm long, 2-5 mm wide; stipels linear to subulate, 3-8 mm long, 0.3-1 mm wide.

Inflorescence axillary, solitary, racemose, 1-5 (6.5) cm long, 1- to 2- (very rarely 4- to 8-) flowered, bearing chasmogamous or cleistogamous flowers; peduncles 0.5-4.5 cm, pubescence uncinata with some subappressed trichomes, occasionally axis elongated, 6-10 (15) cm; rachis lacking, or when present, 0.5-1 (1.5) cm, rarely elongated, 2-4 cm. Pedicels 3-7 mm. Bracts small, inner caducous, middle pair persistent, lanceolate, acute, uncinata pubescent, ciliolate, 3-4 mm long, 1 mm wide, outer bract subcaducous, ovate, 2 mm long, 1 mm wide.

CHASMOGAMOUS FLOWERS: Bracteoles lanceolate to ovate-lanceolate, acute, uncinata-pubescent, 4-9 mm long, 2-3 mm wide. Calyx greenish, 5- (10-) nerved, each leading to a lobe apex, a less prominent nerve to each sinus, pubescence sparse to moderately uncinata, inconspicuous, with few scattered, appressed trichomes, calyx seemingly glabrate, tube 10-14 mm long, 3-5 mm wide at base expanding to 5-8 mm wide at the throat, lobes ovate, short-acuminate, (5) 6-8 (9) mm long, 2.5-3.5 mm wide at base, ventral lobe 7-9 mm. Vexillum glabrate on outer surface, medium-sized blade, 4-6 cm long, 2.5-3 cm wide, blue to pale purplish, claw broadly cuneate, 5-8 mm, blade somewhat decurrent. Alae extended

beyond carina 3-5 mm, blade 13-16 mm long, 3-6 mm wide, claw 11-14 mm, or alae extended beyond carina 7-12 mm, blade 21-24 mm long, 5-10 mm wide, claw 10-12 mm. Carina oblong, oblique on claw, blade 8-13 mm long, 3-5 mm wide, claw 14-21 mm. Staminal tube 21-30 mm, vexillary stamen coherent below middle, free filaments 2-4 mm; anthers lanceolate, 1-2 mm long, 0.5-0.8 mm wide. Gynophore 2-8 mm, moderate to densely uncinat-pubescent; ovary 7-9 mm long, 0.7-0.9 mm wide, pubescence dense, uncinat, occasionally with 1 mm, whitish trichomes along sutures; style 14-20 mm, geniculate 5-8 mm from the distal end; stigma capitate, 0.5-0.7 mm diameter. CLEISTOGAMOUS FLOWERS: Peduncles short to subsessile, 0.4-3 cm. Bracteoles 3-5 mm. Calyx tube 4-5 mm long, 1-2 mm wide, lobes 2-3 mm. Gynophore 1-1.5 mm; ovary 5-6 mm long, 0.7-0.9 mm wide; style 4-6 mm, bent back upon ovary, in contact with anthers. Staminal tube subsessile, ca 0.1 mm, free filaments 1-3 mm. Legume stipitate, valves ecostate, depressed between the seeds, convex, 2.5-5.5 (7) cm long, 6-9 mm wide, pubescence sparse, uncinat, becoming glabrous; stipe extended slightly beyond calyx by 12-17 mm, or enclosed within calyx and 5-9 mm long; beak 2-5 mm; dehiscence causing valves to twist 1-1.5 turns. Seeds cuboidal to globular, black, viscid, 3-5 mm long, 4-6 mm wide, 1-10 seeds per pod; hilum circular, 1 x 0.8 mm. Figures 88, 90, and 91.

Maryland Clitoria is characterized as a suffrutescent, erect herb or vine with blue to purplish, medium-sized flowers born in pairs on short, axillary peduncles, glabrate calices, and ecostate, glabrate fruits that are depressed between the seeds, and with the staminal column of the cleistogamous flowers nearly lacking.

Figure 88. Clitoria mariana - I. Var. mariana f. mariana: (a) stem, erect portion, x 1; (b) calyx, x 1; (c) vexillum, x 1; (d) ala & carina, x 1; (e) androecium, x 1; (f) gynoeceium, x 1; (g) stigma and style apex, x 1; (h) legumes with persistent calyx, x 1; (i) dehiscent legume valve, x 1; (j) three views of seed, x 1. (Hunnewell 5394, GH: a-b. Bty 421 class 1-65, FLAS 80648: c-g. Canby s.n., NY-Coll. Pharmacy Hb.: h. Hermann 11395, MO 1299984: i-j.)





PHENOLOGY: Chasmogamous flowers are produced from May to September with the peak occurring from May to July. Fruits are produced from June to November (rarely October), and occasionally occurring in May. Cleistogamous flowers and its associated fruits are produced predominately from mid July through November, but may occur earlier in the season.

TYPE COLLECTION: Herb. Petiver presumably in Herb. Sloane (BM--not seen).

Linnaeus (1753) based his species C. mariana upon Petiver (1704), the only reference cited in synonymy by Linnaeus. Petiver published the polynominal description "Clitorius marianus trifolius subtus glaucus" in an Appendix to his "Catalogus Plantarum in Hortis Siccis Petiverianis," but did not cite any collection. Savage (1957, Chap. 13) noted that Linnaeus "based his phrase-name nearly always on a specimen or an illustration seen by him, for he distrusted the description of others, and the phrase-name is thus likely to give a significant indication of his intent." The phrase-name used by Linnaeus for C. mariana was "Clitoria foliis ternatis, calycibus cylindricus." The description of the calyx used by Linnaeus could not have come from Petiver, because Petiver had published only his phrase name, which included leaf characteristics only. Linnaeus may have obtained his diagnosis, however, from an examination of Petiver's specimen. Stafleu (1967) noted that Petiver's Herbarium was bought by Sir Hans Sloane in 1718. Savage (l.c., pp. 119-120) indicated that Linnaeus visited Sloane in 1736, had access to Sloane's Herbarium, and based many species on published figures and descriptions of plants preserved in it. Linnaeus thus had the opportunity to have examined the specimen upon

which Petiver had based his phrase-name, and to note the diagnostic characteristic, a cylindrical calyx, which distinguished his C. mariana from two other Clitoria species described by him in 1753. Savage (l.c., p. 120) indicated that Sloane mounted his specimens in volumes to be treated as books. This would account for the lack of Petiver's specimen to have been included in the loan of type specimens from the British Museum, and thus not examined in this study.

A second specimen might possibly be the type. Gronovius (1737) published the only other reference to C. mariana prior to 1753. His phrase-name included the calyx described as "calycibus oblongis." Gronovius cited Petiver's phrase-name in synonymy, and he also cited one collection, Clayton 108 (BM!). Savage (l.c., p. 9) indicated that Linnaeus visited Gronovius in Holland in 1735, and while there, Linnaeus helped Gronovius to classify and name a large collection of specimens gathered in Virginia by John Clayton (l.c., p. 118). Savage also noted (l.c., p. 118) that Linnaeus aided Gronovius with the early Clayton collections, but that due to Linnaeus's early departure, Gronovius had to deal with the later material of Clayton unaided; thus Linnaeus did not see all the specimens described by Gronovius (1737).

Linnaeus (1753) described four species, of which two were included in Gronovius's publication (l.c.). Linnaeus cited "Clitoria foliis ternatis, calycibus campanulatis geminis Gron. Virg. 83." under C. virginiana, but did not cite "Clitoria foliis ternatis, calycibus oblongis Gron. Virg. 83" under C. mariana. Linnaeus had rejected the use of the Gronovian phrase-name associated with Petiver (which Gronovius cited in synonymy), despite a description of the species given by Gronovius, and even though both Linnaeus and Gronovius had

cited the Petiver name in synonymy. Was this a practical application of the principle noted by Savage (l.c., Chap. 13), that Linnaeus distrusted the descriptions of others, and based his diagnosis on specimens he had personally examined? If this is the case, it would appear that the specimen (Clayton 108) cited by Gronovius was one of the Clayton collections not examined by Linnaeus, and thus, not the type.

Historically, the species concept of C. mariana has remained unchanged except for Bentham (1858), who included several elements in synonymy, enlarging the species concept. Unfortunately, Bentham was in error, and being the only revisionary work on the genus, his concept of the species has been largely followed, resulting in some of the present confusion.

Clitoria mexicana Link was included by Bentham, and later reseggregated by others (e.g., Rose, 1899). Clitoria mexicana is easily distinguished from C. mariana by the smaller, white flowers, shorter calyx tube, short-stipitate fruits, and the elongated staminal tube in the cleistogamous flowers. Bentham's error may lie with Schlechtendal (1830) who reported C. mariana from Mexico based upon a misidentified collection (Schlede & Deppe 606, HAL). This collection properly identified is C. mexicana. Other reports of C. mariana occurring in Honduras and Guatemala were probably based upon this error of Schlechtendal or Bentham, as C. mariana is found in the eastern United States and rarely in northeastern Mexico, and C. mexicana in central Mexico to Nicaragua. Clitoria mexicana Link is a distinct species and should not be included with C. mariana L.

Clitoria lancea is an unpublished name that appears on a specimen deposited in the type herbarium at the British Museum Herbarium. The

data on the sheet are "V.1 N. 203" with "Clayton?" [an annotation ?].

The implication is that this specimen is Clayton 203 cited in Gronovius's *Flora Virginica*, Vol. 1 (1739), but citation of this specimen has not been found. The vegetative portions with axillary flowers belong to Clitoria mariana, whereas the solitary, detached, mounted fruit belongs to Centrosema virginianum.

Historically, C. acuminata Grah. ex Wall. and C. grahami Steud. have been cited in synonymy with C. mariana L., instead of being cited in synonymy with C. macrophylla Wall. ex Benth. where these two names correctly belong. Clitoria acuminata Graham was published by Wallich as a nomen nudum, with the type collection being Wallich Hb. 5346. Steudel (1840) changed the name to C. grahami, also a nomen nudum, citing "C. acuminata Graham in Wall." in synonymy. There are two known type specimens (BM!K - hb. Bentham!), both of which agree with C. macrophylla and not C. mariana. Both specimens have the calyx lobes slightly longer than the calyx tube, a calyx pubescence of densely uncinat trichomes beneath the conspicuous, whitened, 1-2 mm long, spreading trichomes. The immature fruits on the British Museum specimen are 5-5.5 cm. Clitoria mariana has the calyx lobes shorter than the tube, a nearly glabrate calyx, and shorter legumes.

Bentham (1852) published a description of C. grahami Steud. and cited the Wallich collection plus a second collection, "Khasiya, Griffith." The description is based primarily upon the Griffith specimen which agrees with C. mariana. Bentham commented on the calyx teeth being shorter than the tube, and that the legume of C. grahami Steud. ex Benth. was shorter than C. macrophylla. Both diagnostic characters disagree with Wallich 5346 specimens. Therefore, only the

portion of the description of C. grahami Steud. ex Benth. which agrees with "Khasiya, Griffith" is placed in synonymy with C. mariana. This includes the majority of Bentham (1852), but not the concept of Steudel (1840) nor Wallich (1831-32).

Two points are noted. First, the Griffith collection is probably Griffith 343 (BM-hb. Miers! CGE-hb. Lemann! K-hb. Hooker). The British Museum specimen lacks any number. The Kew specimen is mounted with two other specimens. Second, based upon the rules of the International Code of Botanical Nomenclature (1972), C. grahami is an orthographic error, and corrected should be C. grahamii.

VERNACULAR NAMES: The most popular name for this species is "Butterfly Pea," which is cited in most American floristic works, and by the following collectors: Porter s.n. (Alabama), McFarlin 678 (Florida), Price s.n. (Kentucky), Plitt 848 (Maryland), Donald s.n. (Mississippi), Fritchley s.n. (Missouri), Brown s.n. (New Jersey), Austin s.n. and Torrey s.n. (New York), Anonymous X4 (North Carolina), Shoop s.n. and Haynie s.n. (Tennessee), and F.H.W. s.n. (Virginia). The name Pigeon Wing was noted by Cleef s.n.

ECONOMIC IMPORTANCE: This species has been cultivated on a limited basis for its showy flowers and climbing habit.

NOTES: Clitoria mariana has its affinities with C. fragrans, but is easily distinguished by its subvoluble habit, larger flowers, longer calyx tube, shorter stipitate fruits, and larger leaflets. Clitoria mariana lacks the purplish hue in its axes and calyx tube, and is much less glaucous in the field.

Clitoria mariana is often confused with C. mexicana and C. macrophylla, both noted above under the discussion of the type.

American specimens are frequently confused with Centrosema virginianum. Centrosema virginianum resembles C. mariana vegetatively in its climbing habit and 3-foliate leaves, but can be easily distinguished by the campanulate calyx, calyx lobes narrow and longer than the tube, bracteoles which nearly hide the calyx, spurred-vexillum, alae subequal to the carina, flat fruits with two marginal nerves, and the lack of a bearded style. Clitoria mariana is also superficially similar in habit to Clitoria cordobensis, of Argentina, from which it is distinguished easily by its larger flowers, longer calyx, and sessile staminal tube in the cleistogamous flowers.

The two major elements of C. mariana are a large American representative and a smaller southeast Asian group. The American variety has larger flowers, and therefore, slightly larger dimensions in petal, gynoecium, androecium, and legume sizes. Cleistogamous flowers and associated legumes are often produced. The Asian variety has more robust vegetative parts and a more pronounced viney habit. Cleistogamy is unknown (or absent) in this group. The magnitude of the differences involved do not warrant segregation into two species despite the widely disjunct distribution.

Vegetatively, this species has a high degree of variation. In the United States, there is a pubescent form occurring in south to central Florida that does not occur elsewhere. The other form has an elongation of the inflorescence and production of more flowers, a regression back towards a more primitive condition.

DISTRIBUTION (Figures 89 and 92): Clitoria mariana has a widely disjunct distribution, occurring in the eastern and southern United States with isolated populations in northeast Mexico and Arizona, and

occurring in east India to southern China. This species is found in dry sandy soil associated with pine, pine-oak, or occasionally oak-hickory associations, in open areas or bluff outcrops of these woodlands. The species has been infrequently reported from gravelly or rocky soil. Steyermark reported the plant growing on chert (6226, 14465, 20165, 20517, 23308, 65165) and Roubidoux sandstone (14726) slopes. Heller 14003 reported the plant grew on clay soil derived from granite.

# KEYS TO VARIETIES AND FORMS:

1. Legume stipe from chasmogamous flowers 12-17 mm; stipule 2-3 mm wide at base; inflorescence stiff, 1-4 cm, 2-flowered, rarely elongated and then stout, nearly straight; gynophore 5-8 mm; alae extended beyond carina 7-12 mm, blade 21-24 mm long, 5-10 mm wide; flowers somewhat larger, 4.5-6 cm; cleistogamy present (United States, rarely NE Mexico, near sea level to 5500 ft) . . . . . 42a. var. mariana
2. Leaflets sparsely pubescent below to glabrate, trichomes subappressed, scattered or confined to major nerves; upper leaflet surface bearing inconspicuous uncinat trichomes, becoming glabrate, macroscopic trichomes absent, macroscopic trichomes on calyx sparse, calyx nearly glabrate (United States to north central Florida, and Mexico).
  3. Peduncle 1-4 (rarely to 5.5) cm, 2-flowered; very common . . . . . 42aa. f. mariana
  3. Peduncle 6-9 cm, (2-) 4-flowered, rachis present; very rare . . . . . 42ab. f. pedunculata
2. Leaflets moderately to densely pilose-sericeous below, trichomes thinning with age, but not widely scattered; upper

leaflet surface bearing inconspicuous uncinat trichomes plus conspicuous, 0.3-1 mm whitish trichomes which are deciduous with age (some leaflets bear few vestigial trichomes, becoming eventually glabrous); macroscopic trichomes on calyx moderate, subappressed to slightly spreading, conspicuous, deciduous with age . . . . . 42ac. f. pubescentia

1. Legume stipe from chasmogamous flowers 5-9 mm; stipule 3-5 mm wide at base; inflorescence short, 1-6 cm, lax to weakly stiff at some nodes, becoming elongated (5-15 cm), slender and somewhat vine-like, at other nodes, 2- or 4- (6-) flowered; gynophore 3-4 mm; alae extended beyond carina 3-5 mm, blade 13-16 mm long, 3-4 mm wide; flowers somewhat smaller, usually 4-5 cm; cleistogamy lacking or unknown (southeast Asia) . . . . . 42b. var. orientalis

42a. Clitoria mariana L. var. mariana

Clitorius marianus trifolius subtus glaucus Petiver, Cat.

Pl. Hort. Sicc. Petiv. Appendix 3: 243, no. 55. 1704;  
nom. illeg.

Clitoria foliis ternatis, calycibus oblongis Gronovius, Fl.

Virg. ed 1. 1: 83. 1739; nom. illeg.

Clitoria foliis ternatis, calycibus cylindricis L. ex Gron.,

Fl. Virg. ed. 2. 111. 1762; nom. illeg.

Vexillaria mariana (L.) Raf., Am. Monthly Mag. 268, no. 111.

1818; nom. illeg.

Nauchea mariana (L.) Desc., Mem. Soc. Linn. Proc. 4: 9.

1826; nom. illeg.



Ternatea mariana (L.) Kuntze, Riv. Gen. Pl. 1: 210. 1891.

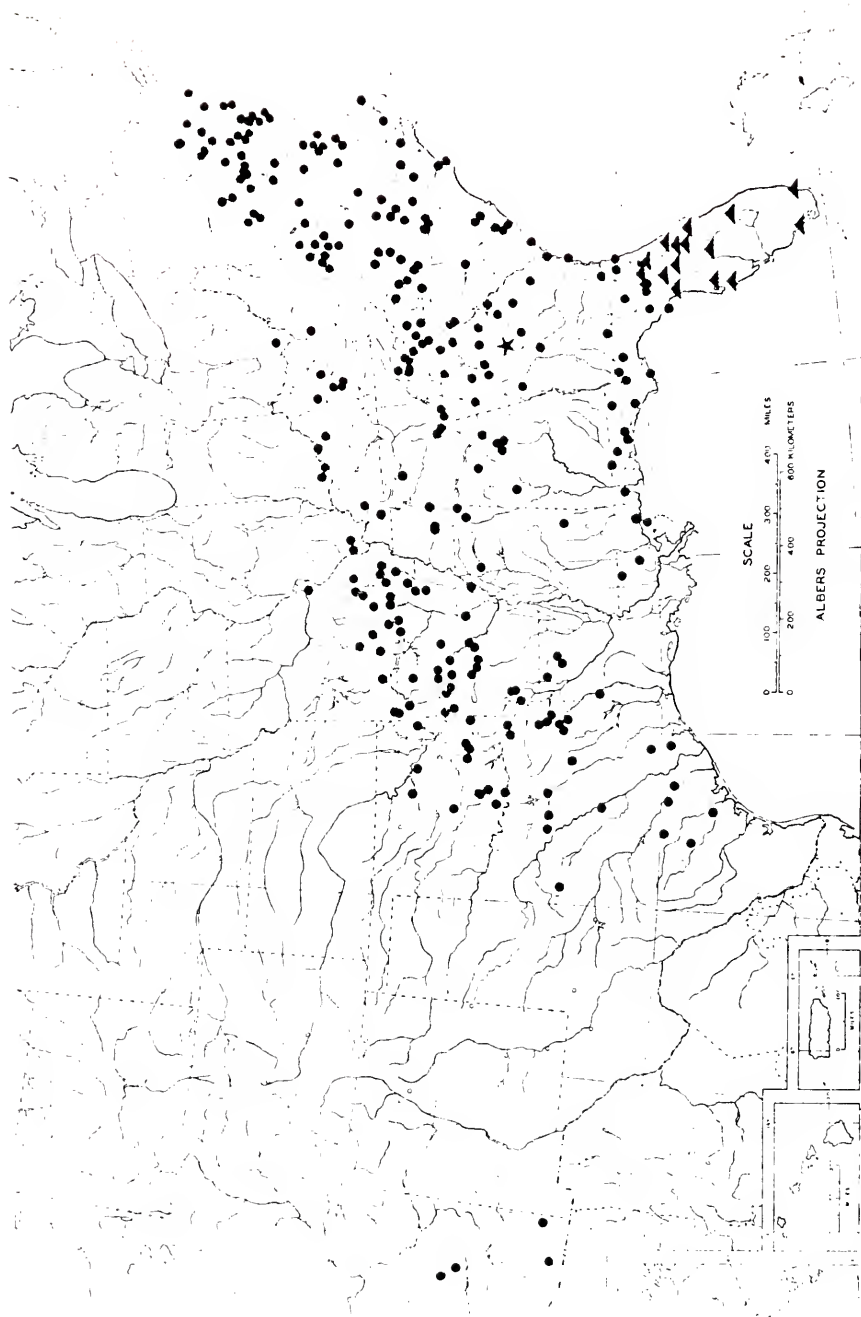
Clitoria lancea, nom. in sched.

Perennial suffrutescent herb, lower stem portion erect to lax, upper portion trailing to somewhat climbing. Leaflets 2-7 (8) cm long, 1-3 (3.5) cm wide, primary nerves of 7-9 pairs. Stipules 4-8 mm long, 1-3 (3.5) mm wide. Inflorescence short, stout, 2-flowered (rarely 4-flowered); peduncle typically 1-4 cm, rarely elongated and nearly straight, 6-9 cm. Flowers 4.5-6 cm. Vexillum claw 5-7 mm. Alae extended well beyond carina by 7-12 mm, blade 21-24 mm long, 5-10 mm wide, claw 7-12 mm. Carina 11-13 mm long, 4-5 mm wide, claw 18-21 mm. Gynophore 5-8 mm; ovary 8-9 mm; style 16-20 mm. Legume 2.5-5.5 cm or occasionally 6-7 cm long, bearing 6-10 seeds per pod; stipe 12-17 mm. Cleistogamy present.

The typical variety can be easily distinguished by its larger wings, longer stipe, and short, stout inflorescence.

DISTRIBUTION (Figure 89): The typical variety is found in eastern and southern portions of the United States, from New Jersey-Pennsylvania to eastern Missouri-Texas, with few collections obtained north of the Ohio River. Isolated populations occur in the mountains of southeast Arizona and northeast Mexico. This variety is found in pine woodlands of the Coastal Plain, and in pine-oak or oak-hickory woods of more or less mountainous terrain, to elevations of 5000 ft. Plants grow in open areas, typically in sandy soil or occasionally rocky ground, usually as isolated individuals, or in small community clusters.

Figure 89. United States distribution of *Clitoria mariana*, section *Mexicana*. Var. *mariana* f. *mariana* (●); f. *pubescentia* (▲), f. *pedunculata* (★).



42aa. Clitoria mariana L. var. mariana f. mariana

Leaflets sparsely pubescent below to glabrate; upper surface uncinat-pubescent. Inflorescence short, 1-4 (5.5) cm, stout. Calyx pubescence seemingly glabrate, bearing inconspicuous uncinat trichomes plus a few, scattered macroscopic trichomes.

DISTRIBUTION (Figure 89): The typical form is very common throughout the range of the typical variety except southern Florida. Because of the extensive distribution in the United States, each state will be treated similar to the treatment of a country as found elsewhere in this monograph, and each county in turn becomes elevated to the major geographical division.

L O C A L I T Y U N K N O W N. Anonymous s.n. (S); Amer. Septr., Anonymous s.n. (BM); l.c., Anonymous 330 (M-hb. Schreber); Anonymous 65 (GH-Gray Hb.); Hampton, 20 Jul 1927, Anonymous s.n. (PH); Wissahicon Creek, 5 Aug 28, Anonymous s.n. (UC); Arnott s.n. (E); 1813, Baldwin 2047 (PH); Beauvois s.n. (G-2 sh.); 1822, Ensler s.n. (W); Fink hb. s.n. (MO); Foreman s.n. (F-hb. Schott); 24 Jul 04, H.A.G. s.n. (MO); El Paso & Ft Yuma Wagon Rd Exp., Ark-Tex-Ariz, Hayes s.n. (F); Western Branch, Jul 1840, Hayes 17 (M); Houghton s.n. (MICH); S United States, Jun 1888, McCarthy s.n. (UC); Muhlenberg 1967 (PH-3 sh.); Hb. Schreber s.n. (M); Hb. Schwoeegrichen s.n. (M); Schweinitz s.n. (NY,PH); Shafer s.n. (E); near Corinth Nip, 1863, Stewart s.n. (F); Hb. Ventenat s.n. (G-2 sh.); Cherokee Country, Tumor 1769 (BM); Verte s.n. (S-2 sh.); Wood s.n. (NY); Wood 174 (NY).

N E W Y O R K. Hb. Austin s.n. (NY); 1843, Torrey s.n. (G,GH,MO, NY-2 sh.).

NEW JERSEY. Green s.n. (CGE); 1834, Torrey s.n. (E,PH); Jun, hb. Tuckermann s.n. (G); Pine barrens, hb. Lindley s.n. (CGE); Little Snake Hill, 23 Sep 1871, Leggett s.n. (NY). ATLANTIC: Hammonton, 10 Jul 91, Crawford s.n. (F); l.c., 17 Aug 92, Crawford s.n. (PH); l.c., Sep 1892, Keller s.n. (PH-2 sh.); l.c., Jul 1893, Bassett s.n. (PH); via Hammonton ad Asion, 11 Sep 1892, Brinton s.n. (PH). CAPE MAY: Cape May, 13 Aug 1925, Leeds 1450 (PH); Cape May Court House, 6 Aug 1909, Stone 11748 (PENN); l.c., VanPelt s.n. (PH); l.c., Brown s.n. (PH); E Lily Lake, Cape May Point 18 Jul 1920, Stone 15676 (GH,PENN-2 sh.,PH); l.c., 9 Aug 1925, Stone s.n. (PH); west Cape May, 9 Sep 1917, Brown 393 (GH); l.c., 22 Jul 1919, Brown s.n. (PH); l.c., 10 Jul 1923, Brown s.n. (PENN); l.c., 24 Jul 1924, Brown s.n. (PENN); l.c., 26 Sep 1920, Long 23545 (GH,NY); l.c., Race Course, 10 Sep 1917, Brown s.n. (PH); Bennett, 5 Aug 1909, Eckfeldt s.n. (PENN); N branch of Ponk Creek, Cold Spring, 12 Jul 1899, Brown s.n. (PH); Goshen, 16 Aug 1925, Driesbach 3805 (MICH,PH); near Sharp's Branch, ca 3 mi N of Hunter's Mill, 13 Aug 1935, Long 47348 (PH); 1 mi W of Wildwood Junction, 11 Jul 1920, Brown s.n. (PH). OCEAN: Toms River, Anonymous s.n. (NY); l.c., 1833, Gray s.n. (GH).

PENNSYLVANIA. Schweinitz s.n. (E); banks of Schuylkill near Lemon Hill, Jul 1883, hb. Wister s.n. (PH). BERKS: S slope Mt Neversink, Reading, 20 Aug 1927, Wilkens s.n. (PENN,PH); l.c., 1 mi NW of Neversink Station, 20 Jul 1939, Wilkens 5964 (PENN,PH); SW slope Mt. Neversink, 6 mi SSE of Reading, 20 Aug 1936, Brumback 2537 (FLAS); RR 0.375 mi WSW of Klapperthal, 480 ft, 22 Aug 1940, Berkheimer 2165 (GH,PENN,PH). LANCASTER: Culleys, 1 Aug 1906, Carter s.n. (PH) and 4 Aug, s.n. (NY); near "Pinnacle Rock" below Culley, 2 Sep 1906,

Brown s.n. (PENN,PH-2 sh.); island below McCall's (=McCall's Ferry), 26 Aug 1905, Carter s.n. (PH); l.c., 1 Sep 1906, Small s.n. (NY); island in Susquehanna R opposite Fites Eddy, 24 Aug 1938, Tanger s.n. (PH) and 12 Jul 1939, 3377 (GH,PENN); above Fites Eddy, 2 Sep 1906, Williamson s.n. (NY); RR above Fites Eddy, 2 Sep 1906, Brown s.n. (PH); vic Safe Harbor, 2 Aug 1889, Small s.n. (F); Wissler, 4 Jul 1939, Maynard 3353 (PENN,PH). PHILADELPHIA: Hb. Lemann s.n. (CGE); N side Wissabicken Creek near Philadelphia above RR bridge, ca 1837, James s.n. (PH); hill N of Spring Garden Waterworks, Philadelphia, Smith s.n. (PH); hb. Nuttall s.n. (BM).

D E L A W A R E. 1849, Alexander s.n. (UC); Collins Beach, 9 Aug 1866, Commons s.n. (PH); Rockford, Jul 1888, Tatnall 670 (GH). NEW CASTLE: E side Brandywine Creek just below Bancrofts Dam, Wilmington, 12 Jul 1933, Tatnall 1914 (PH) and 13 Aug 1932, 1528 (GH); Brandywine, Wilmington, 24 Jul 1874, Commons s.n. (G,MICH,NY,PH) and 4 Sep, s.n. (GH,MO-2 sh.,NY,PH-2 sh.); Brandywine, Aug 1858, Canby s.n. (NY); l.c., Canby s.n. (GH); Wilmington, Sep 1872, Canby s.n. (UC); l.c., Tatnall s.n. (GH) and 1849 (UC) and 1866 (GH). SUSSEX: near Gumboro, 4 Aug 1874, Commons s.n. (PH); Laurel, 19 Aug 1880, Commons s.n. (PH); Ellendale, 22 Jul 1908, Long & VanPelt s.n. (PH); near Milford, 6 Jul 1913, Long & Bartram 1571 (PH).

M A R Y L A N D. 1698, Krieg s.n. (E); 1797, Hingston s.n. (MPU). ANNE ARUNDEL: 25 Jul 1904, Plitt 848 (GH); Annapolis, Read s.n. (PH-mixed). BALTIMORE: near Baltimore, 1866, LeRoy s.n. (NY-2 sh.). CAROLINE: Denton, 7 Jul 52, Seal s.n. (PH). CECIL: Gilpins Rocks, Jul 1884, Carter s.n. (PH); Elkton, 7 Jul 1852, Seal s.n. (PH); 4 mi SE of North East, 11 Aug 1949, Stiteler s.n. (PH). DORCHESTER:

Williamsburg, E Shore, 28 Aug 1873, Morong s.n. (NY). MONTGOMERY: Linden, 19 Jul 1922, Benedict s.n. (PENN); Plummer's Island in Potomac River near Cabin John, 24 Jul 1910, Kearney & Maxon 36 (GH); near Cabin John, 31 Jul 1926, Blake 9593 (G-2 sh.); Great Falls, 22 Jun 1902, Dowell 1562 (GH); l.c., 30 Jun 1918, Hunnewell 5394 (GH); l.c., 23 Jun 1939, Hermann 10384 (F). PRINCE GEORGES: East Riverdale, 15 Jul 1923, Muenschner 3746 (MO); 0.5 mi S of Greenbelt, 1 Oct 1944, Hermann 11395 (MO). QUEEN ANNE: Chestertown, 15 Aug 1902, Vanatta s.n. (PH). TALBOT: East Wye River, slopes 9.5 mi NNE of Easton, 5 Jul 1937, Earle 1537 (PENN); 0.75 mi NW of Longwoods, 6 Sep 1942, Earle 3767 (GH,PH). WASHINGTON: Williamsport, Jul 1869, Alcott s.n. (A); Maryland Heights, 17 Jul 1910, Pennell 2411 (PH). WICOMICO: Salisbury, 15 Jul 1904, Carter s.n. (PH-2 sh.). WORCESTER: Snow Hill, Sep 1883, Canby s.n. (NY); 1.7 mi NE of Pokomoke City via Rt 113, 5 Jul 1930, Tatnall 943 (PENN,PH).

D I S T R I C T O F C O L U M B I A. Bebb s.n. (F); 1862, Bebb s.n. (NY); 1863, Bebb s.n. (BM,F-2 sh.,GH,M,MICH,NY,PH); hills back of Columbia College, Bebb s.n. (F); vic Washington, 29 Jun 1896, Steele s.n. (E,MO); l.c., 13 Jun 1880, Ward s.n. (GH); l.c., Aug 188-, McCarthy s.n. (CGE,F); l.c., 9 Jul 1899, Steele s.n. (G); l.c., 22 Jul 1899, Steele s.n. (G); Aug 1895, Holm s.n. (MPU,S-2 sh.,W); 22 Jul 1888, Holm s.n. (GH); Terra Cotta, 15 Aug 1895, Pollard 585 (NY); l.c., 11 Aug 1898, Holm 27636 (F,MO,WIS); District line toward Hyattsville, 6 Aug 1910, Dowell 6406 (F,FLAS,MO); 1881, Canby s.n. (WIS).

V I R G I N I A. 1833, Brynes s.n. (MO); Clayton 108 (TYPE for *Clitoria foliis ternatis*, *calycibus oblongis*: (BM); Clayton 705 (BM); Curtiss s.n. (F); C.M.D. s.n. (E-143); Jul. Darrach s.n. (PH); 1 Jul

1921, Grimes 3912 (PH); Ft. Myer, 13 Jul 1895, Meams s.n. (GH); 40 mi S of Lynchburg, 17 Jul 1880, Porter s.n. (PH); Bradford, 12 Jul 28, Wall 383 (S). ALLEGHENY: bluffs 4 mi N on route 42 from junction with US Route 60, 12 Sep 1946, Wood 6843 (GH). AMHERST: between Blue Hole & Slaty Gap above Rocky Row Run, 28 Jul 1960, Freer 2586 (GH). BATH: Millboro, 14 Oct 1933, Alexander, Everett, & Pearson s.n. (NY). BEDFORD: Curtiss s.n. (G-2 sh.); 15 Jul 1870, Curtiss s.n. (UC); 21 Jul 1871, Curtiss s.n. (GH,MO,NY); 15 Jul 1872, Curtiss s.n. (F-2 sh.,S); 15 Jul 1873, Curtiss s.n. (E,NY). BOTEOURT: along Rt 622 down James River from Arcadia, 28 Jul 1954, Freer 2197 (GH); near Eagle Rock, 450 m, 18 Aug 1903, Steele & Steele 7 (MO,NY); above Craig Creek, ca 3.75 mi NW of Eagle Rock, 23 Aug 1946, Wood 6649 (GH). CRAIG: 660 m, 26 Aug 1903, Steele & Steele 7 (E,GH,MO). ELIZABETH CITY: vic Hampton, 20 Jul 1927, Churchill s.n. (WIS). FAIRFAX: bank Potomac above Georgetown DC in Va., 14 Aug 1873, Carter s.n. (PH). FAUQUIER: W slopes Bull Run Mts, 19 Sep 1936, Allard 2280 (F,NY); Bull Run Mts, 2.5 mi NE Plains, 5 Oct 1938, Hermann 9900 (F,MICH). FRANKLIN: near Wirtz, 6 Jul 1941, Ikenberry s.n. (MO). FLUVANNA: bluff above James R at Brems, 6 Sep 1945, Baldwin 5418 (GH). GILES: Peters Mt ca 1 mi N of Narrows, 17 Jul 1940, Fogg 17353 (PENN). GLOUCESTER: 1 mi N of Gloucester, 9 Jul 1924, Meredith s.n. (PH). HALIFAX: 12 mi E Danville via JEB Stuart Hwy, 20-21 Jun 1938, Fosberg 15400 (PENN). HENRICO: Elko, 30 Aug 1925, Wherry & Pennell 12516 (MO,NY,PH); Richmond, 1833, MacNab s.n. (BM); l.c., Fairway Ridge, 10 Jul 1928, F.H.W. s.n. (GH); 3 mi NW of Richmond, 16 Jun 1938, Henry 1280 (PH). JAMES CITY: Matoaka Park, 12 Jul 1939, Baldwin 361 (GH); ca 3 mi N of Williamsburg via Rt 60, 20 Jun 1930, Menzel 34 (GH). MECHLENBERG:



Cuscovilla, 18 Jul 1924, Meredith s.n. (PH). MONTGOMERY: ca 0.5 mi E Ironto along Virginia RR, 31 Aug 1946, Wood 6701 (GH,UC); 1 mi NE Ironto & 8 mi E of Blacksburg, 37°14'N-80°16'W, 29 Jul 1958, Iltis 19757 (WIS). NANSEMOND: Suffolk, 2 Jul 1892, Britton, Britton, & Vail s.n. (NY); 1.c., 24 Jul 1893, Heller 1131 (E,F-3 sh.,G,MO,NY-2 sh.,PENN, PH, UC); 1.c., along RR, 16 Jun 1940, Gleason 8567 (NY); 2 mi NE Suffolk, 29 Jul 1945, Hubricht B2827 (G). NELSON: between Afton & Lovington, 2500-3000 ft, 28 Jun 1925, Rydberg 9227 (NY). NEW KENT: S side Davis Pond 0.4 mi from dam, Barhamsville, 8 Jul 1974, Soltis 290 (FLAS); prope Portsmouth, Jul 1840, Rugel s.n. (BM,E); vic Norfolk, 3 Jul 1892, Britton & Britton s.n. (G); 1.c., Sewalls Points, 8-16 Jul 1904, Harrison s.n. (GH); Ocean View, 3 Jul 1923, Meredith s.n. (PH); 2 mi E of Deep Creek, 2 Jul 1944, Hubricht B2517 (MO-mixed). NORTHAMPTON: S of Kendell Grove, 13-15 Oct 1935, Fernald, Long, & Fogg 5338 (GH,PENN, PH). PITTSYLVANIA: Co. Rd. 706 ca 2.5 mi from junction with 718, 13 Jul 1968, Ruska & Waggoner s.n. (VSC). PRINCE GEORGE: Camp Lee, 18 Jun 1919, Bonar s.n. (MICH). PRINCESS ANNE: Oceana, 2 Jul 1923, Meredith s.n. (PH); Cape Henry, 1 Aug 1927, Churchill 529 (MO-2 sh.); 1.c., end R-5 at the Narrows, 6 Jul 1940, Egler 40-25 (NY); Virginia Beach, 27 Jul 1934, Fernald & Long 3982 (GH,NY,PENN); 1.c., Owl Creek, 8 Aug 1934, Fernald & Long 3984 (GH-2 sh.,PH). ROANOKE: Chestnut Ridge just S of South Roanoke, 25 Aug 1942, Wood 5302 (PENN); Green Ridge ca 1.5 mi NNE of Hanging Rock, 30 Jun 1942, Wood 3078 (PENN) and ca 2 mi 1.c., 3438 (GH); summit ridge Catawsa Mt. ca 4.5 mi NW of Hanging Rock, 6 Jul 1946, Wood 6119 (GH). SHENANDOAH: near Edinburg, Hunnewell 17515 (GH); Three Top Mt, Massanutten, 3 mi NE Woodstock, 22 Sep 1938, Hermann 9832 (NY,PH). SOUTHAMPTON: Gray s.n. (PH); 1806,

Pursh s.n. (PH-frag.); Three Creek, Drewryville, 22-23 Jun 1936,  
Fernald, Long, & Smart 5815 (GH,PH). SPOTSYLVANIA: Fredericksburg,  
 21 Aug 91, Porter s.n. (NY,PH). SUSSEX: Waverly, 20 Jul 1891,  
Seymour 91720.68, cit. no. 5 (GH,MO,S,UC,WIS). YORK: ca 1.5 mi NW of  
 Grove, 21 Jun 1922, Randolph & Randolph 350 (GH). WESTMORELAND:  
 Colonial Beach, 14 Aug 1904, House 222 (NY).

W E S T V I R G I N I A. Ridgeville, 18 Aug 1894, Harper & Harper  
s.n. (MICH,UC). HARDY: cliffs near Wardensville, 10 Jul 1932,  
Hunnewell 12415 (GH). JEFFERSON: Harper's Ferry, 1843, Anonymous s.n.  
 (GH). MINGO: Ritters Forest, headwaters of Elk Creek, 11 Jul 1930,  
Berkley 1048 (MO). WAYNE: Cabwaylingo State Park, 10 Jul 37, Gilbert  
598 (F,GH,MICH,MO,NY,PENN,PH,WIS).

O H I O. JACKSON: Whites Gulch, 26 Jul 36, Bartley & Pontius 51  
 (NY).

K E N T U C K Y. Chamelson Springs, Jul 1894, Price s.n. (MO-  
 an illust.). CALLOWAY: S of Almo, 23 Jul 1937, Smith & Hodgdon 4182  
 (GH). ESTILL: NE of Harg, 16 Jul 1938, Wharton 3102 (MICH). FAYETTE:  
 Lexington, cult. from seed from Ga., Short s.n. (PH). HARLAN: Pine  
 Mt, Aug 1893, Kearney 100 (E,F-2 sh.,G,GH,MO,NY,S): Aug 1893,  
Kearney s.n. (F). LYON: between Birmingham & Eddyville, 25 Jul 1937,  
Smith & Hodgdon 4223 (PH,PR). MADISON: Burnt Bridge Ridge, E of  
 Berea, 7 Jul 1937, Smith, Hodgdon, & Brown 3642 (F,GH,NY). NELSON: 5 mi  
 NE of New Haven, 17 Jul 1940, Wharton 5565 (MICH). POWELL: Natural  
 Bridge, 29 Jul 1923, Anderson 44 (GH); l.c., 29 Jul 23, MacFarland 311  
 (MO,S). ROCKCASTLE: S of Livingston, 9 Jul 1937, Smith & Hodgdon 3748  
 (GH); between Mt. Vernon & Livingston, 9 Jul 1937, Smith & Hodgdon  
3724 (GH).

I N D I A N A. HARRISON: State Forest, 2 Sep 1945, Friesner 19566 (UC); l.c., ca 12 mi SW of Corydon, 2 Sep 1945, Deam 63729 (FLAS). PERRY: ca 7 mi SE of Cannelton, ca 0.25 mi N of VanBuren Ridge School House, 1 Oct 1920, Deam 33193 (GH-2 sh.). SPENCER: 2.5 mi S of Lincoln City, 17 Jul 1925, Deam 41621 (GH).

I L L I N O I S. Anonymous s.n. (WIS); Herod, 30 Jul 1898, Hart s.n. (UC). JOHNSTON: Ozark, 4 Sep 1931, Benke 5241 (F,MICH); Parker, 4 Sep 1931, Benke 5242 (F,GH,MO). UNION: 2 Aug 1878, Earle s.n. (F); Forbes s.n. (GH,MICH).

M I S S O U R I. BUTLER: Poplar Bluff, 1 Jul 1893, Eby s.n. (MO); l.c., 30 Jul 1897, Savage & Stull 1259 (F). CARTER: 13 Jul 1888, Fritchley s.n. (MO); Van Buren, Jul 1938, Meebold 25302 (M). DOUGLAS: along trib. of Bryant Creek SE of Sweden, 20 Aug 1934, Steyermark 14726 (MO); along Spring Creek near Roosevelt, S23,T25N,R11W, 17 Jul 1937, Steyermark 23308 (FM,P). DUNKLIN: Campbell, 20 Jun 1934, Cunningham s.n. (MO). HOWELL: "County Hollow" 5 mi NE of Peace Valley, 12 Aug 1934, Steyermark 14465 (MO); bluffs along Noblette Creek, 4 mi SW of CCC Camp F-6, S25,T26N,R11W, 12 Sep 1936, Steyermark 20064 (MO). IRON: Pilot Knob, 1845, Englemann s.n. (MO); l.c., 20 Aug 1895, Glatfelter s.n. (MO-2 sh.); l.c., 26 Jun 1920, Palmer 18092 (MO). MCDONALD: 24 Jul 1893, Bush 46 (F,GH,MO,NY,UC); Noel, 7 Aug 1908, Bush 4990 (GH,MO,NY); Arch Creek Hollow, 5.5 mi S of Powell, S17-T21N,R31W, 25 Sep 1947, Steyermark 65165 (F); Indian Springs, 26 Jul 1955, Palmer 60678-A (WIS); Miles Creek, 1 mi E of Powell, 31 Jul 1956, Palmer 63419 (WIS). MADISON: Mine La Motte, 24 Jul 1898, Eggert s.n. (MO). NEWTON: Reddings Mill, 26 Sep 1908, Bush 5201 (MO); l.c., 14 Jul 27, Kellogg 985 (MO) and 14 Jul 28, s.n. (MO); along Shoal Creek near Reddings Mill, 14 Jul 1927,

Palmer 32487 (G,GH,MO-2 sh.,NY); 1 mi S of Joplin, 26 Sep 1908, Palmer 1505 (MO). OREGON: White Creek Valley from Fidler Spring, 3.5-4 mi S of Wilderness, 5 May 1938, Steyermark 5416 (F). REYNOLDS: S end of Tom Sauk Mt SW of Munger, 20 Aug 1932, Steyermark 4870 (F). RIPLEY: near Tunnel Bluff, Current River near Carter Co. line, 8 mi W of Grandin, 18 Oct 1936, Steyermark 20517 (MO). ST. LOUIS: Mo. Botanical Gardens, St. Louis, 15 Jul 03, Kellogg s.n. (MO); Allenton, Letterman s.n. (MO). SHANNON: 2 Jul 1886, Eggert s.n. (MO); Monteer (=Montier?), 4 Aug 1927, Bush 11423 (G,MO); Jam up on Jack's Fork, 13 Aug 31, Kellogg s.n. (MO); "shut-ins," Round Mt, 3 mi SW of Midridge, 27 Sep 1936, Steyermark 20165 (MO). STODDARD: Crowleys Ridge, 1 mi N of Ardeola, 8 Nov 1936, Steyermark 20778 (MO). STONE: Marvel Cave, 11 Sep 1898, Trelease 1007 (MO). TEXAS: Houston, 14 Jul 1913, Emig 148 (MO). WAYNE: Clark Mt, Aug 1897, Russell s.n. (MO); Valley of Mill Creek, 1.5 mi SW of Wappapello, S4,T26N,R7E, 29 Aug 1938, Steyermark 6226 (F,MO); St. Francis R just SE of mouth Redman Creek, 0.75 mi SW of Wappapello, S3, T26N,R7E, 3 Sep 1938, Steyermark 6493 (F).

N O R T H C A R O L I N A. Curtiss s.n. (MO,PH); in mountains, Ashe s.n. (NY); near Big Willow, 12 Jul 1947, Hood 87 (FLAS);Brockland, 1 Sep 13, Nieuwland 11371 (MO); Long Beach, 11 Jul 1963, Wilbur 6966 (MICH,UC). BLADEN: E rim of Suggs Mill Pond Bay, 17 Jun 1956, Melvin 3603 (VSC). BUNCOMBE: Asheville, Aug 1888, Taylor s.n. (F); l.c., 2 Aug 1893, Robinson 72 (GH); Black Mt, 26 Jun 1948, Goodrich s.n. (MICH). CATAWBS: N of Hickory, 25-26 Jun 1891, Small & Heller s.n. (F). CLAY: Hayesville, Aug 1900, Anonymous X4 (NY). CRAVEN: New Bern, Loomis & Croom s.n. (PH). CUMBERLAND: 0.5 mi S of Rockfish Creed S of Fayetteville, 26 Jun 1949, Fox & Godfrey 2387 (NY). DARE: Ft Raleigh,

Roanoke Island, 25 Jul 1959, Schallert 4970 (S). DAVIDSON: 0.5 mi E of Yadkin R via US Rt 70, 21 Aug 1949, Fox & Godfrey 3133 (UC). DURHAM: Crows Nest, Duke Forest, 22 Jun 1934, Blomquist s.n. (F,PENN,PH); near Sand Creek ca 1 mi S Duke Stadium, 27 Jun 1940, Woodbury 111 (MO). EDGECOMBE: 2 mi W of Old Sparta, 5 Jul 1922, Randolph & Randolph 746 (GH); 8 mi E Rocky Mt, 12 Jun 1949, Fox & Godfrey 2364 (FLAS). FORSYTH: 20 May 41, Schallert s.n. (NY,UC); Salem, Schweinitz s.n. (PH-2 sh.); Winston-Salem, 15 Jun 40, Schallert s.n. (MO). FRANKLIN: 2 mi E of New Hope on Rt 98, 15 Jul 1966, Mueller s.n. (WIS-mixed). GATES: near Roduco, 6 Jul 1935, Correll & Oosting 2247 (GH-mixed,NY). GRAHAM: US 129 near Cheoah Creek, 5 mi SE of Tapoco, 19 Aug 1956, Radford 15923 (S-mixed). HALIFAX: Weldon, Jul 1878, Canby s.n. (NY); l.c., Jul 1894, Williamson s.n. (PH) and Aug, s.n. (PH); l.c., Aug 1894, hb. MacElwee s.n. (PH); l.c., Jul 1885, Williamson s.n. (UC). HARNETT: near Erwin, 7 Jun 1938, Godfrey 4252 (GH); Lillington, 5 Aug 1938, Godfrey s.n. (FLAS). HENDERSON: S slope Long John Mt, 22 Jul 1945, Goodrich s.n. (MICH). HYDE: 15 mi W of Swanquarter, 23 Jun 1927, Wiegard & Manning 1642 (GH). JACKSON: Cullowhee, 15 Jul 1887, Thaxter s.n. (GH); Cashier's Valley, Boltwood s.n. (WIS); l.c., 14 Jul 1888, hb. Dunham s.n. (F); 2 mi W Cashiers, 17 Jul 1954, Hardin 212 (MICH). LEE: Deep River Basin 0.25 mi from river, W from Patterson's Creek, 2 Aug 55, Kessler 406 (FLAS). LINCOLN: Lincolnton, Carpenter 223 (NY). MECKLENBERG: Lakewood Park, Charlotte, 22 Jul 1935, Correll 3023 (GH); along Catawba R just S of US 29-74, 30 Jun 1958, Ahles & Duke 44919 (UC). MOORE: Southern Pines, 13 Jun 1920, Besquert s.n. (GH). NEW HANOVER: Wilmington, 16-22 Jun 1894, MacFarlane s.n. (PENN); Carolina Beach, 15 Jun 1938, Godfrey 4626 (GH). RICHMOND: Hamlet, 17 Jun 1897,

Biltmore 161b (NY). ROBESON: 2 mi W of Fair Bluff Rd, 7 Jul 1961, Hardin 2399 (GH). ROWAN: Salisbury, 21 Jun 1890, Heller 36 (MO,NY, PH); l.c., Sep 1881, Fiss s.n. (PENN); Faith, 11 Jun 1926, Heller 14003 (G,MO). SAMPSON: 5 mi W of Clinton, Godfrey 4500 (GH); 6 mi S of Dunn, 18 Jul 1940, Hood 75 (UC). SCOTLAND: 5 mi NE of Laurinburg, 11 Jun 1938, Godfrey 4584 (GH); NE of Laurel Hill, 27 Jul 1958, Duke 1681 (NY). SWAIN: 26 Jul 1891, Beardslee s.n. (PENN); Great Smokey Mts, 1750 ft, Aug 1891, Beardslee & Kofoid s.n. (GH,MICH,MO,NY,PH); l.c., Cherokee Indian Reservation, Pine Hill in Bryson City, 26 Jul 1930, Cain s.n. (BM,NY,WIS). UNION: 1.2 mi W of New Salem, 7 Jun 1957, Ahles & Haesloop 27672 (GH). VANCE: Ruin Creek on US Rt 158A ca 4 mi SW of Henderson, 31 Jul 1956, Ahles & Leisner 17319 (W). WAKE: Raleigh, Anonymous s.n. (NY); l.c., Hillebrand s.n. (M); l.c., 12 Jun 1938, Godfrey 4616 (GH,NY); l.c., 23 Jun 49, Alexander s.n. (UC). WAYNE: Seven Springs, 16 Jul 1949, Fox & Godfrey 2717 (NY). WILKES: Brushy, 5 mi E of North Wilkesboro, 2 Jul 1949, Fox 2447 (PH); Stewarts pasture, 0.25 mi S Bunland Orchard, Brushy Mts, 9 Jul 1940, Stewart 1727 (NY). YADKIN: Davis s.n. (PENN-2 sh.).

S O U T H C A R O L I N A. ANDERSON: Anderson, 20 Aug 1919, Davis s.n. (G) and 25 Aug, s.n. (UC); l.c., 29 Jul 1920, Davis s.n. (MICH,U); l.c., 25 Jul 1921, Davis s.n. (MO); l.c., suburbs, 11 Aug 1917, Davis 7702 (MICH) and 7754 (PH); l.c., 25 Jul 1919, Davis s.n. (MO); Whitner Park, Anderson, 6 Aug 1917, Davis 7702 (MO); Baldwin woods near Anderson, 15 Aug 1919, Davis s.n. (MO); Pelzen, 5 Jul 1906, House 2426 (NY). BERKELEY: RR 1 mi S of Moncks Corner, 7 Aug 1939, Martin 1131 (NY,UC); 1.9 mi S-SW of junction US 52 & 17A on US 52, vic Moncks Corner, 27 May 1957, Ahles & Haesloop 26489 (U). BEAUFORT: St. Helena

Island, 1895, Cuthbert s.n. (FLAS) and Sep 1902, s.n. (FLAS).

CHARLESTON: near Charleston, Jul 1866 Stewart s.n. (F). CHEROKEE: Blacksburg, 18 Jul 1906, House 2517 (MO). COLLETON: along US 17, 31 May 35, Drushel 10572 (MO); along County Rd 63 near junction with US 17A, 25 Jun 1956, Bell 3654 (E,WIS). DORCHESTER: Summerville, Brownfield s.n. (MICH-mixed). GEORGETOWN: 7 mi E Andrews, 27 Jun 1939, Godfrey & Tryon 168 (F,GH,MICH,MO,NY,PENN,PH,UC). PICKENS: 7 Jul 1897, Anonymous 1336 (NY); near Clemson College, 29 Sep 1906, House 2948 (MO). RICHLAND: Columbia, Jun 1894, MacFarlane & Davis s.n. (PENN-2 sh.); l.c., intersection of Helena Rd & Crystal Drive, 15 Jun 1976, Nelson 579 (FLAS). WILLIAMSBURG: 2 mi N of Kingstree, 11 Jun 1927, Wiegand & Manning 1645 (GH).

G E O R G I A. 1840, Gray s.n. (NY); 1846, Porter s.n. (GH,MICH VSC). BROOKS: 5.5 mi NNW of Quitman, 1 Jul 1965, Faircloth 2012 (MO, VSC); 13.3 mi SE of Quitman, 0.3 mi N of Ochlawilla Church, 8 Jul 1966, Faircloth 3359 (MO,VSC). BULLOCH: ca 8 mi S of Statesboro near Lower Lott's Creek Church, 9 Jul 1961, Boole 1158 (GH-2 sh.). BURKE: Sicad Church near Idlewood, 19 Jun 1947, Hood 1 (FLAS). CARROLL: Tyus Road, 2 Aug 1967, Lovvorn s.n. (VSC). CHATHAM: Savannah, Elliott s.n. (GH); Thunderbolt, 25 Jul 1923, Crawford s.n. (PH). CHEROKEE: ca 3 mi W of Canton, 18 Jun 1948, Duncan 8399 (MO); along Jug Creek 2.5 mi N-77°W of Canton, 865 ft, 31 Jul 1934, Duncan 8557 (MO). CLARKE: Athens, Jun 1897, Harper s.n. (NY); l.c., Bobbin Mill Creek, 16 Jun 1934, Perry 910 (GH). COBB: near Chattahoochee R, 790 ft, 9 Jul 1900, Harper 4 (BM,E, F,GH,MO,NY,W); Kenesaw Mt, Jul 1929, Rhoades s.n. (GH). COLQUITT: 6.5 mi W of Lenox, 11 Jul 1966, Faircloth 3365 (VSC). COLUMBIA: Keg Creek, 3.6 mi W-7°N of Clark Hill Dam, 220 ft, 23 Jun 1949, Duncan 9738 (MO).

DEKALB: Little Stone Mt, 1000-1100 ft, 7 Jul 1893, Small s.n. (F-2 sh., G-2 sh., GH,MO,NY,UC); Stone Mt, 24 Jul 1897, Eggert s.n. (F,MO-3 sh., NY,UC); l.c., Jul 1909, Smith 2366 (F,WIS); l.c., 17 Aug 1927, Wiegand & Manning 1647 (GH); l.c., 30 May 1933, Miller et al. 533 (MO,PH); l.c., summit, 1686 ft, 4 Jul 1893, Small s.n. (F) and 6-12 Sep 1894, s.n. (NY,PH); l.c., S base, 18 Jun 1959, Dress & Read 7447 (E,M,WIS).

FANNIN: Blue Ridge Mts, 22 Jul 1909, Smith 2457 (F). FLOYD: Rome, Jul-Aug 1925, Rhoades s.n. (WIS). FULTON: near McPherson Monument, Atlanta, 23 Jul 1890, Barnhart 558 (NY); 8 mi W of Atlanta, 24 Sep 1945, Henry 4148 (PH); College Park, 1000 ft, 10 Jun 1960, Schallert 4970 (S).

GREENE: 1 mi W of Union Point, 17 Jul 1950, Duncan 11343 (GH).

GWINNETT: vic Thompson Mills, 22 Jun 1908, Allard 111 (F,GH,MO,NY).

HABERSHAM: vic Toccoa Falls, 8 Aug 1893, Small s.n. (F-2 sh.). HOUSTON: ca 1.5 mi SE Wellston, 11 Jun 1944, Ainsworth 44611.2 (PH). JEFFERSON: vic Louisville, Hopkins s.n. (NY). LEE: 2 mi SE of Bynes Crossroads, 27 Jul 1974, Bryan s.n. (VSC). LOWNES: north campus G.S.W.C., Valdosta, 14 Jun 1939, Nevins 721B (VSC 1421, non 1420); 10 mi ESE of Valdosta, 30 Jun 1953, Quarterman & Duncan 16727 (VSC); 3.5 mi NW of Valdosta, along Withlacoochee R., 25 May 1963, Greer s.n. (VSC). MCINTOSH: Sapelo Island, 9 Jul 1954, Hardin 190 (MICH). MERIWETHER: 1.5 mi S of Warm Springs, 18 Jul 1940, Henry 2215 (PH). OGLETHORPE: 7 mi N of Lexington, 24 Aug 1947, Cronquist 4600 (MO-mixed,NY). RABUN: Clayton, 1 Jul 1911, Reade E3477 (PENN); Tallulah Falls, 18 Jun 1911, Reade E3478 (PENN); Chattooga R Gorge, SE slope 1st Mt SW of Burrell's Ford, 2500 ft, 22 Aug 1968, DuMond 1519 (G). TIFT: 5.4 mi S of Tifton, 18 Jul 1968, Faircloth 5344 (VSC). WARREN: 3-4 mi S of Warrenton,



9 Jun 1939, Harper 1112 (BM,PH). WILKINSON: 0.6 mi SE of McIntyre,  
4 Jun 1950, Duncan 11071 (FLAS).

F L O R I D A. Buckley s.n. (MO); Chapman s.n. (GH,MO,NY-2 sh.,  
PH); 1841, Chapman s.n. (GH); 1845, Chapman s.n. (BM). ALACHUA:  
Gainesville, 15 Jun 1910, Hood s.n. (FLAS,MICH,MO); Rochelle, 9 Jun  
1927, Weber & West s.n. (FLAS); N side of Watermelon Pond 6 mi S of  
Newberry, S4, T11S, R1-E, 29 Apr 1960, Botany Class I-65 (FLAS). BAY:  
Lynn Haven, 16 May 1923, Billington s.n. (MICH-2 sh.). COLUMBIA: Lake  
City, 21 Jun 1892, Bitting s.n. (FLAS-3 sh.); l.c., 189-, Rolfs 87  
(FLAS,MO). DIXIE: 5.5 mi N of Oldtown, 18 Aug 1937, Pasture Survey s.n.  
(FLAS). DUVAL: Jun, Curtiss 670 (BM,GH,M,MO,NY-2 sh.,PH) and Aug,  
670 (F,FLAS-2 sh.); near Jacksonville, 6 Jun 1893, Curtiss 4245 (MO,UC);  
l.c., 12 Jul 1894, Curtiss 5104 (MO,W); S Jacksonville, Aug 1928, Lang  
s.n. (PH); St. Nicholas, 16 Jun 1896, Lighthipe 250 (NY); Girmin Road,  
Arlington, 14 Jul 1963, Creager 221 (FLAS). ESCAMBIA: 6 mi W of  
Century, 8 Aug 1954, Ford s.n. (FLAS). FRANKLIN: East Pass, 1 Sep 1899,  
Tracy 6329 (E,F,G-2 sh.,GH,MO,NY,W). GADSEN: Exp. Sta. Quincy, 30 Jun  
36, Foster 34 (FLAS). HOLMES: 3 mi SW of Bonifay, 22 Jul 1954, Ford  
3544 (FLAS). LAKE: Silver Lake, 19 Apr 1935, Tisdale s.n. (FLAS-2 sh.).  
LEON: near Tallahassee, Berg s.n. (NY); 5 mi N of Tallahassee, 30 May  
1957, Kral 4759 (FLAS,U). LEVY: Jun-Jul 1892, Hitchcock 3:90 (F);  
Cedar Keys, 1874, Palmer 176 (MO); l.c., airstrip, 1952, Ford 4720 (FLAS);  
Rosewood, 1876, Garber s.n. (FLAS). LIBERTY: between Hosford &  
Bristol, 8 Jun 1955, Godfrey, Reese, & Redfearn 53391 (FLAS,GH,NY,UC).  
NASSAU: N of Hilliard, 10 Jul 1951, Hood 4433 (FLAS). OKALOOSA: near  
Valpariso, 26 Jun 1939, Henry 1629 (PH); Eglin Field, 22 May 1950,  
Goodrum 8 (FLAS). PUTNAM: Palatka, 24 Jun 1910, Hood s.n. (FLAS).

SANTA ROSA: 4 mi NW of Holt, 2 Jun 1952, Tyson 749 (FLAS). SUWANNEE: E of Luraville, 9 Aug 1946, West & Arnold s.n. (FLAS). WAKULLA: Marshes Island, 16 Jul 1967, McDaniel 9386 (FLAS); St. Marks, Jun 1843, Rugel ?, hb. Shuttleworth s.n. (BM). WALTON: Eglin Air Force Base, ca 10 mi E Niceville, head Mullet Creek, W edge Range 52A, 9 May 1967, Ward, Smith, & Chapman 6321 (FLAS).

A L A B A M A. Aug 1841, Buckley s.n. (BM-2 sh., NY, S); Evert s.n. (F); Gates s.n. (NY); Hatch s.n. (WIS); Nevius s.n. (WIS); Nuttall s.n. (BM); Sep 1843, Rugel s.n. (BM). BLOUNT: 20 Jun 1897, Eggert s.n. (MO). CULLMAN: 22 Sep 1898, Eggert s.n. (MO); Cullman, 11 Jun 1891, Sudworth s.n. (MICH); l.c., 5 mi SE along 8 Mile Creek, 12 Jun 1934, Leeds 2154 (PH); St. Bernard, 27 Jul 1907, Wolf s.n. (UC). DALLAS: 15 Jul 1879, Trelease s.n. (MO). ETOWAH: 11 Jul 1898, Eggert s.n. (NY); Black Creek Falls, 1 Jul 1897, Eggert s.n. (MO); Sans Mt, Littleton, 9 Jul 1898, Eggert s.n. (MO); Lookout Mt N of Atalla, 11 Jul 1898, Eggert s.n. (MO). JACKSON: Sand Mt, Aug 1916, Graves 1074 (MO); l.c., Bryant, 15 Jun 1936, Porter s.n. (GH). LEE: Auburn, 9 Jun 189-, Earle s.n. (MO); l.c., 11 Aug 1897, Earle & Baker s.n. (MO, NY, WIS); l.c., Sep 1898, Earle s.n. (F); l.c., 29 Jul 1898, Earle & Baker s.n. (F). MARSHALL: 1 mi W of Warrenton, 12 Jun 1934, Leeds 2153 (PH). MOBILE: Mobile, 1833, Jewett 285 (G). PIKE: 3-4 Jun 1909, Spring Hill, MacKenzie 4037 (NY). ST. CLAIR: Beaver Creek Mts, 18 May 1946, Ripley & Barneby 7370 (NY); summit Shoal Creek Mt ca 10 mi N pell City, 300 m, 28 May 1948, McVaugh 11 (MICH); mt crest 20 mi NE of Birmingham, 29 May 62, Deramus 188 (GH). TUSCALOOSA: 1 mi N of Elrod, 17 Jul 1939, Hubricht B1655 (MO).

T E N N E S S E E. Paint Rock, Williamson s.n. (F); Clinch Mt, Wood s.n. (NY); White Cliff Sprs., 5 Jul 1890, Lamson-Schribner s.n. (NY). BLOUNT: Maryville, 21 Jul 1812, Faxon s.n. (GH); l.c., Shoop s.n. (MICH); Walland, 23 Jul 1924, Wehmeyer 252 (MICH); Great Smokey Mt Nat Park, Hannah Mt, on headwaters of Panther Creek, 1 Jul 1936, Camp 1680 (NY); Great Smokey Mt Nat Park, E of Cades Cove, 1800-2000 ft, 12 Jul 1936, Camp 1817 (NY); l.c., W end Cades Cove, 1800-2200 ft, 20 Jul 1936, Camp 1967a (NY) and 1967b (NY). CHESTER: Henderson, Jun 1892, Bain 53 (NY). DAVIDSON: Joelton, 16 Jul 1922, Svenson 113 (GH). DECATUR: Jul 1885, Ames s.n. (MICH). DICKSON: 5 mi W of White Bluffs, 1 Sep 1930, Svenson 4398 (GH,PH). FRANKLIN: Sewanee, Sep 1881, Smith s.n. (PH,WIS); Sherwood, 1886-87, Bridgman s.n. (UC). HAMILTON: Lookout Mt, 1878, Vasey s.n. (F,NY,PH); l.c., Jun 1870, Allen s.n. (NY); Chattanooga, 23 Sep 1892, Leeds s.n. (F). KNOX: Knoxville, Aug 1893, Ruth s.n. (UC-mixed) and Jul 1895, s.n. (MO-2 sh.) and Jul 1898, 299 (NY) and Jul 1898, 309 (MO) and Jun 1897, 2396 (NY); l.c., Lake Ootossee, Jul 1895, Ruth s.n. (F,GH,MO,S-2 sh.,WIS-2 sh.). MADISON: 4 mi NW of Pinson, 15 Jul 1939, Hubricht B1636 (MO). MARION: South Pittsburg, 1892, Middleton s.n. (BM). MORGAN: Rugby, 19 Jul, Percival s.n. (F). SEVIER: Gatlinburg, Aug 1931, Haynie s.n. (F); Elkmont, 26 Jul 1924, Wehmeyer 323 (MICH); l.c., path to Laurel Falls, 10 Sep 1935, Harris 1850 (GH).

M I S S I S S I P P I. Chaudelaur Island, 30 May 1898, Tracy 4846 (NY: not F,MICH,MO); Tibbee, 23 Jun 1927, Donald s.n. (WIS). HARRISON: Biloxi, 10 Jul 1900, Tracy 4846 (BM,E,G,MO,W); Cat Isant, 26 Aug 1900, Lloyd & Tracy 178 (BM,NY-2 sh.,W); Gulfport, 8 Sep 1900, Lloyd & Tracy 168 (NY). JACKSON: Ocean Springs, 19 Jul 1889, Earle s.n. (MO).

LAUDERDALE: 1 mi E Meehan Junction Hwy 80, 8 Sep 1969, Jones et al. 17679 (FLAS). PANOLA: hills on Tallahatchie R, 18 Aug 1898, Eggert s.n. (MO). PRENTISS: 2 mi SW of Booneville, 16 Jul 1939, Hubricht B1648 (FLAS,MO). TISHOMINGO: above Bear Creek, Tishomingo State Park, 15 Jun 1956, Ray 6397 (GH); mouth Mill Creek, trib. Bear Creek, NE of Iuka, 28 Jul 1974, Coleman s.n. (FLAS).

L O U I S I A N A. Anonymous s.n. (WIS); Hale & Mead s.n. (F); Pickering, 8 Jul 1909, Sheley s.n. (MO). BIENVILLE: Driskill Mt, S17, T33N, R5W, 500 ft, 27 Jul 1955, Moore 6254 (FLAS,GH); Williamson Cemetery, 1.5 mi E of Sailes, Sec. 34, 26 Jun 1958, Lasseigne 1679 (FLAS). CATAHOULA: Cemetery 2.5 mi S of Duty Ferry, NW part of S1, T10N, R5E, 11 Jun 1975, Thomas, Callais, & Crews 44782, 834 (VSC). LINCOLN: near Ruston, 12 May 1925, Palmer 27171 (MO). ST. HELENA: ca 1.5 mi SE of Chipola, S63, T2S, R4E, 3 Jun 1971, Allen 904 (FLAS). ST. TAMMANY: Covington, 1832, Drummond s.n. (BM); vic l.c., Sulphur Springs, 2 Jul 1920, Arsene 11754 (F). UNION: along US 167 at Big Cornie Bayou, NE corner of S22, T22N, R3W, 5 Jun 1965, Pyrah, Frackmann, & Smith 351 (NY). WEBSTER: near gas line clearing, S27, T22N, R9W, 18 Jun 1955, Moore & Moore 6126 (GH).

A R K A N S A S. Anonymous 27 (HAL); Hays s.n. (NY); Sityreaves s.n. (GH); throughout mts, 1884, Harvey s.n. (F); Aug, NW Arkansas, Harvey 73 (GH); Demaree 22371 (MO); Choctaw Agency, 1853-54, Bigelow s.n. (NY); --- to Fort Gibson, midway to Little Rock, Jun 1855, Anonymous 169 (MO-2 sh., hb. Englemann). BENTON: 1899, Plank s.n. (NY-2 sh.); Sulphur Springs, 21 Jun 1908, Palmer 1423 (MO-2 sh.). CONWAY: Petit Jean Mt, Petit Jean State Park, Morrilton, 1000 ft, 2 Jul 1955, Demaree 37190 (GH); l.c., 1050 ft, 20 Jul 1955, Demaree

37475 (GH). CRAIGHEAD: Jonesboro, 4 Jul 1927, Demaree 3563 (MO-2 sh., WIS) and 20 Jul, 3701 (MO-mixed). CROSS: Crowley's Ridge, Levesque, 300 ft, 24 Jul 1939, Demaree 19621 (MO,NY,UC); A. & M. College Farm, Monticello, 250 ft, 7 Aug 1938, Demaree 18020 (NY-mixed; not MO). FAULKNER: Demaree 5871 (NY) and 5872 (NY) and 5877 (NY); Guy, 4 Sep 1934, Demaree 10960 (GH,MO); near Quitman, 12 Sep 1934, Ford 199 (FLAS). FULTON: Mammoth Springs, 11 Sep 1928, Demaree 5330 (NY); Viola, 600 ft, 9 Aug 1957, Demaree 39685 (GH). GARLAND: Hot Springs, 30 Jul 1879, Letterman s.n. (MO) and 5 Aug, s.n. (MO); l.c., 18 Jul 1884, Kellogg s.n. (MO); l.c., summer 1928, Runyan 1187 (NY-mixed); l.c., 15 Oct 1925, Palmer 29236 (MO); l.c., Ouachita mt, 13 Jul 1948, Chase 9734 (F,NY) and 21 Jul, 9924 (F); Cedar Glades, 600 ft, 28 Aug 1939, Demaree 20484 (MO,NY). GREENE: near Paragould, 27 Jul 1893, Eggert s.n. (MO); Green Co. line S to Paragould, Crowley's Ridge, 5 Aug 1927, Demaree 3957 (MO); Crowley's Ridge State Park, Walcott, 400 ft, 6 Jul 1950, Demaree 29345 (GH); l.c., 320 ft, 8 Apr 1948, Demaree 27201 (VSC). HEMPSTEAD: Fulton, 31 10, Kellogg s.n. (MO); McNab, 9 Sep 1919, Palmer 16341 (MO). HOT SPRING: Magnet Cove, 600 ft, 30 Jun 1937, Demaree 15338 (MO,NY-2 sh.) and 4 Sep 1937, 16214 (NY) and 7 Jul 1946, 25668 (GH). HOWARD: Baker Springs, 5 Oct 09, Kellogg s.n. (MO). JOHNSTON: Piney Creek, Knoxville, 400 ft, 13 Aug 1939, Demaree 19915 (MO,NY). LEE: 21 Jun 1935, Griffin & Demaree 37 (MO). LOGAN: Magazine Mt, 2800 ft, 18 Jun 1938, Demaree 17755 (MO,NY); l.c., N of Cove Lake, ca 7 Mi SE of Paris, S35, T7N, R25W, 1350-1450 ft, 8 Jun 1955, Iltis 5323 (GH,WIS). MILLER, Texarkana, 300 ft, 30 Jun 1943, Demaree 24468 (MO). NEWTON: Jasper, 18 Jun 1932, Moore 32523 (GH). PERRY: Lake Sylvia, Ouachita Nat. Forests, Thornburg, 1000 ft, 25 Aug 1937, Demaree 16001 (NY). PHILLIPS: Crowley's Ridge,

Helena, 300 ft, 6 Aug 1939, Demaree 19750 (MO,NY). POINSETT: Harrisburg, 250 ft, 29 May 1938, Demaree 17557 (NY) and 18 Jul 1927, 3688 (NY). POPE: Dover, 11 Aug 1939, Demaree 19832 (MO,NY). PRAIRIE: Grand Prairie, DeValls Bluff, 180 ft, 15 Jun 1941, Demaree 22210 (MO, NY). PULASKI: Little Rock, 5 Jul 1885, Hasse s.n. (NY); l.c., Pulaski Heights, 3 Aug 1941, Demaree 22372 (NY,UC); l.c., Fourche Mt, 400 ft, 22 Aug 1955, Demaree 38103 (GH). SALINE: Bauxite, 29 May 1955, Demaree 36931 (GH). SEBASTIAN: Fort Smith, 1853-54, Bigelow s.n. (NY); near l.c., 27 May 1928, Demaree 3121 (MO); Mansfield, 600 ft, 30 Aug 1938, Demaree 18141 (MO,NY). SEVIER: Mineral, 25 Jul 1937, Brinkley 209 (F). WASHINGTON: 16 Aug 1895, Blankenship 17247 (WIS); Mt Sequoyah, Fayetteville, 9 Jul 1924, Wheeler 4 (F). YELL: top of Mount Nebo, Dardanelle, 1700 ft, 16 Aug 1939, Demaree 20097 (MO,NY,UC); Tones Mt, Dardanelle, 400 ft, 16 Aug 1939, Demaree 20003 (MO,UC).

O K L A H O M A. Cherokee Nation Indian Terr., 18 Aug 1895, Blankenship s.n. (GH,MO); Okla. Exp. Sta., Waugh 329 (MO); False Washita between Fort Cobb & Fort Arbuckle, Indian Terr., 1868, Palmer 109 (NY); near Cimarron City, Jul 1893, Olive 24 (F). CARTER: Ardmore, 8 Jul 1916, Palmer 10397 (MO,PH,S). CHEROKEE: 4 mi NE OF Tahlequah, 10 Oct 1941, Booker 16 (UC); 22.8 mi N of Tahlequah via Okla. 10 at Adair line, 8 Aug 1951, Wallis 906 (UC). CLEVELAND: 7 Aug 1900, White 75 (MO). CREEK: Sapulpa, 20 Sep 1894, Bush 121 (MO). JOHNSTON: Tishomingo, 9 Sep 1914, Palmer 6464 (MICH,MO). LATIMER: E Gowen, 12 Jun 1930, Clark 2673 (G-2 sh.); 7.5 mi N of Wilburton, 29 Aug 1970, Stephens 44404 (UC). LEFLORE: near Page, 11 Jul 1914, Blakeley 1520 (GH,MO,NY). LINCOLN: Fouts, 4 Jul 1896, Blankenship s.n. (MO). MCCURTAIN: S of Idabel, 4 Jun 1937, Waterfall 672 (NY). MARSHALL:

Island no. 2, Lake Texoma, 10 Jul 1954, Goodman 5922 (GH,UC); 2 mi E of Shaw, 17 Jul 1961, Shed 167 (G). MURRAY: 6 mi N of Sulphur, 14 Jun 1941, Hopkins 5890 (MO,NY). PAYNE: Jul 1893, Olive 24 (NY). PITTSBURG: McAlester, 31 May 1894, Newhall s.n. (GH); l.c., 5 Sep 1914, Palmer 6401 (MO). PONTOTOC: NE of City Lake, Wintersmith, Ada, 9 Jul 1947, Robbins 2620 (NY,UC); 0.5 mi S of Ada, 2 Jun 1948, Robbins 3074 (NY,UC).

T E X A S. Hb. Lemann s.n. (CGE); Reverchon s.n. (MO); Buzzards Spring, 1 Aug 1902, Reverchon s.n. (MO); Harrisburg, Jul 1842, Englemann hb. 17703 (MO); Piedenales (?), 1847, Lindheimer s.n. (MO). AUSTIN: San Felipe, Drummond s.n. (NY); College Station, 29 May 1915, Palmer 7815 (MO,PH); Kurten, 28 Apr 1918, Palmer 13488 (MO). CALLAHAN: Clyde, 30 May 1918, Palmer 13813 (MO,WIS). COLORADO: Columbus, 11 Jun 1911, Rusby s.n. (NY). DALLAS: Dallas, 2 Jul 1872, Hall 115 (BM,F-2 sh., MO,NY-3 sh.); l.c., Jun 1880, Reverchon 265 (F,MPU); l.c., 17 Jun 1898, Glatfelter s.n. (MO); below Bachman Dam, Jun 1937, Lundell & Lundell 7046 (MICH); near Seagoville, 11 Jun 1940, Lundell & Lundell 9387 (MICH, NY,UC). DENTON: E side Lake Dallas, 13 Jun 1940, Lundell & Lundell 9451 (MICH). ERATH: Morgan Mill, 13 Jun 41, Tharp s.n. (GH,MO,NY, PH,UC). FAYETTE: Colony, 1893, Crawford 16 (MO); 1892, Crawford 34 (F). GREGG: Gladwater, 18 Jun, Reverchon s.n. (MO). GOLIAD: near Fannin along US 96, 21 Jun 1935, Drushel 10105 (NY). HARRIS: Houston, Jul 1842, Lindheimer s.n. (GH); ca 0.2 mi S of Bridge over San Jacinto R via US 59, 23 mi N of Houston, 60 ft, 3 Jul 1956, Traverse 162 (F,GH); Hockley, 1890, Thurrow s.n. (F). HAYS: vic San Marcos, Stanfield s.n. (NY). HENDERSON: 8 mi W of Athens, 30 May 1942, Sanders 159 (MICH). JASPER: S of Jasper via US 96, 9 Sep 1942, Lundell & Geiser 11809 (MICH). MARION: Big Cypress Bayou near Jefferson, 13 Jun 1957, Correll

& Correll 16769 (UC). MONTGOMERY: Conroe, 1 Jun 1892, Plank s.n. (NY). MORRIS: Daingerfield State Park, 5 Jun 1946, Correll & Correll 12439 (MICH,NY). PARKER: Weatherford, 27 May 1902, Tracy 8335 (BM,E,F, G,GH,MO,NY,W); W Cross Timbers, 24 mi NW of Forth Worth, 7 Jun 1941, Innes & Moon 966 (GH,UC). RED RIVER: Pitcher s.n. (GH); Burk s.n. (PENN). RUSK: Waldern, May-Aug, Vinzent 8 (BM,MO,W). SABINE: 10-3-1934, Cory 10776 (GH). SMITH: Sand Flat Rd, Amigo, 29 Aug 1945, Moore 1016 (GH). TARRANT: 16 Jul 1913, near Handley, Ruth 400 (NY,UC); 6 Jul 1919, Ruth 400 (PENN-2 sh.); 16 Jul 1919, Ruth 400 (PH); aLong H.P.R.R., 16 Jul 1920, Ruth 400 (F); l.c., 6 Jul 1921, Ruth 400 (WIS-2 sh.); 6 Jul 1923, Ruth 400 (GH); Fort Worth, 25 Jun 1918, Palmer 14233 (MO,WIS); l.c., Spring 1935, Macart 52 (MO). TRAVIS: Austin, May 1849, Wright s.n. (G); l.c., 13 May 18, Young 43 (GH,MO,UC-2 sh.). UPSHUR: 5 mi N of Ore City, 13 Jul 1946, Correll 13157 (NY). WILSON: Parks 8924 (GH).

A R I Z O N A. COCHISE: Huachua Mts, Jul-Sep 1882, Lemmon 2664 (BM,E,F-3 sh.,G-2 sh.,GH,NY,PH); Chiricahua Mts, Five Mile Creek, near Shaws, 5300 ft, 26 Aug 1907, Blumer 2071 (F). GILA: Parker Creek Canyon, Exp. Station Grounds, Sierra Ancha Mts, 4600 ft, 1 Sep 1946, Gould 3803 (UC); Shadow Rim Scout Camp Rd, NE of Payson, 5200 ft, 2 Aug 1964, Lehto 3905 (BM). PIMA: Santa Rita Mts, 26 Jul 1884, Pringle 11 (GH); l.c., bottoms, Lower Madera Canyon, 2 Sep 1944, Clark 12360 (GH); Santa Catalina Mts, 2 mi below Federal Prison Camp Hqds., 4500 ft, 18 Aug 1945, Parker, McClintock, & Haskell 5877 (MO,NY).

M E X I C O. NUEVO LEON: La Trinidad, Mun. Montemorelos, 19 Aug 1939, Mueller 2841 (F,GH,MICH,MO,NY,UC); Dulces Nombres & just E into Tamaulipas, 1550 m, 2 Jul 1948, Meyer & Rodgers 2729 (G,GH,MO,U).



42ab. Clitoria mariana L. var. mariana f. pedunculata Fantz,  
f. nov.

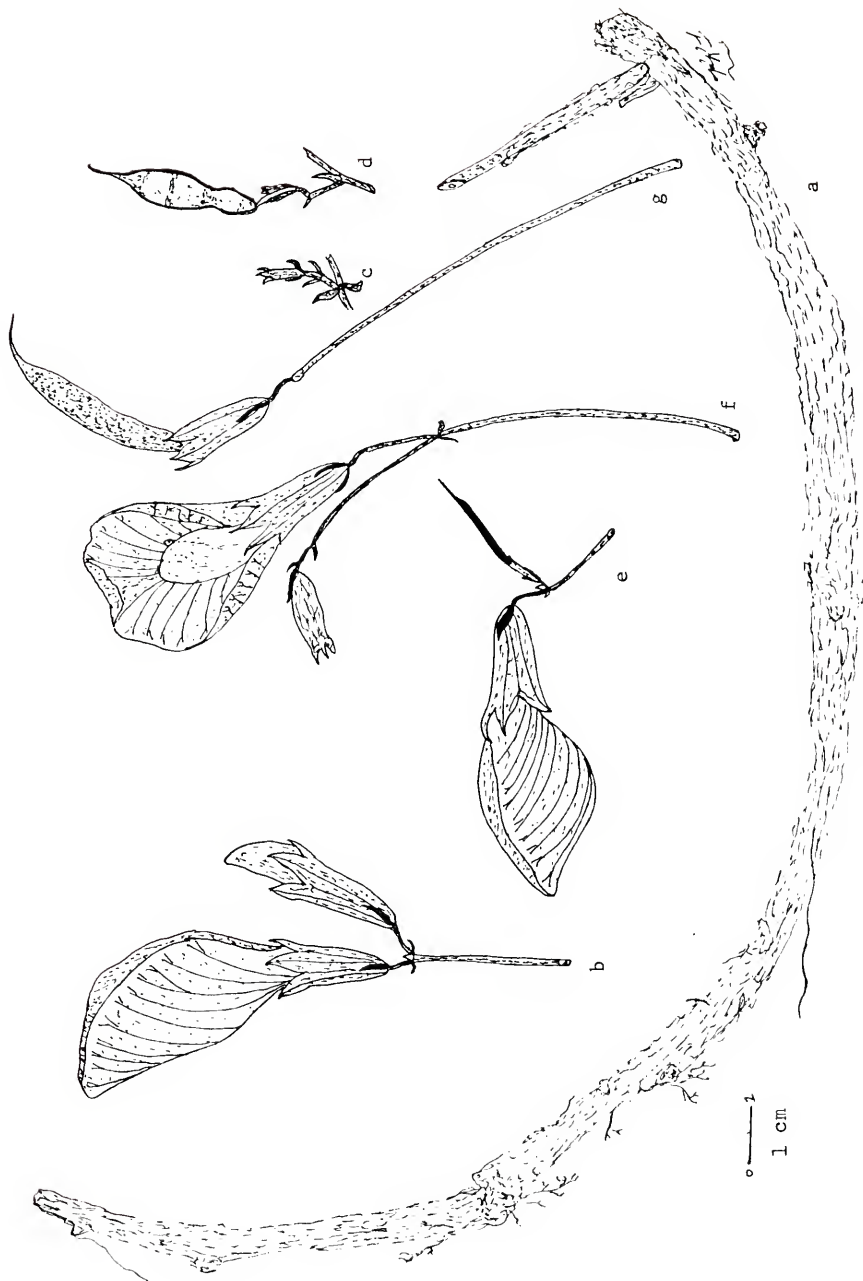
Leaflets sparsely pubescent below to glabrate; upper surface uncinately pubescent. Inflorescent elongated, nearly straight to very weakly arcuate, stiff, 6-10 cm, 2- or 4-flowered; peduncle 6-9.5 cm; rachis sublackling to 1.5 cm. Calyx pubescence seemingly glabrate, bearing inconspicuous uncinately trichomes plus a few, scattered macroscopic trichomes. Figure 90.

TYPE COLLECTION: UNITED STATES. Georgia: Monticello, 1846, Hb. T.C. Porter s.n. (HOLOTYPE: PH 731728).

NOTES: This form is clearly distinct from the typical form because of the elongated peduncles. Superficially, it resembles some individuals of southeast Asia (var. orientalis) which commonly exhibit elongated inflorescences. This form can be distinguished from the southeast Asian members by a stout, stiff peduncle that is nearly straight or very weakly arcuate, in addition to the larger flowers and more narrow stipule. The elongated, racemose inflorescence is a more primitive condition. This form is extremely rare.

DISTRIBUTION (Figure 89): This form is known only from one additional collection besides the type collection. A specimen in the Muhlenberg Herbarium (PH) has one isolated inflorescence mounted between two specimens of f. mariana. The herbarium sheet bears the number "1967:sheet 3" in pencil. Its origin is unknown.

Figure 90. Clitoria mariana - II. Var. mariana f. mariana:  
(a) xylopodium, x 1; (b) inflorescence with chasmogamous  
flowers, x 1; (c) inflorescence with cleistogamous flower,  
x 1; (d) legume from cleistogamous flower, x 1; (e)  
chasmocleistogamous inflorescence, x 1. Var. mariana f.  
pedunculata: (f-g) inflorescences, x 1. (Hunnewell 5394,  
GH: b. Fantz 2011, Hb. Fantz: a. Berkheimer 2165,  
PENN: c-d. Carter Hb. s.n., PH: e. Hb. Porter s.n.,  
PH 731728: f-g.)



42ac. Clitoria mariana L. var. mariana f. pubescentia Fantz,  
f. nov.

Leaflets moderately to densely pilose-sericeous below, the trichomes conspicuous, suberect to erect, thinning with age, but not widely scattered or confined to nerves; upper surface of leaflet bearing inconspicuous uncinata trichomes plus conspicuous, 0.3-1 mm, falcate to subappressed, whitish trichomes which are deciduous with age. Inflorescence short, stout, 1-4 cm. Calyx pubescence somewhat conspicuous, uncinata trichomes plus moderate to somewhat scattered, subappressed to slightly spreading, 0.3-1 mm trichomes which are deciduous with age.

TYPE COLLECTION: UNITED STATES. Florida: Lake County, near edge of Lake at Leesburg, 7 Jun 1967, Baltzell 120 (HOLOTYPE: FLAS 99034).

Baltzell 120 was chosen as the holotype because it is the best representative specimen which clearly illustrates all three of the diagnostic characteristics. The upper leaflet surface is conspicuously pubescent. The macroscopic trichomes have not yet dropped off the leaflet surface. Most specimens have only the inconspicuous uncinata trichomes remaining on the upper leaflet surface, the macroscopic trichomes having already dropped. However, by a careful examination of the specimen, remnant trichomes can sometimes be located.

The lower leaflet surface is the most reliable site for distinguishing the pubescent form. Baltzell 120 represents an intermediate stage. These leaves are conspicuously pubescent below, but some collections have these trichomes thinned out and somewhat spaced apart, but the trichomes are still conspicuous, not confined to the nerves or very widely

scattered. Those specimens whose leaves have a more densely pubescent lower leaf surface are easily distinguished as the pubescent form.

The pubescence of the calyx is variable because these macroscopic trichomes are also shed. Baltzell 120 has a conspicuously pubescent calyx, typical of this form. These macroscopic trichomes will soon drop and the calyx becomes somewhat glabrate, resembling f. mariana.

NOTES: The pubescent form occurs only in var. mariana and is prominent in specimens from Florida and absent elsewhere throughout the range of var. mariana. Specimens from southern Florida are very conspicuously more pubescent than these specimens from northern states. However, there is a transition zone in north-central Florida where the two forms intergrade. Specimens with thinned to scattered pubescence on the lower leaflet surface and subglabrate calices become more difficult to distinguish to form. Specimens are designated f. pubescentia in these specimens if they bore remnants of macroscopic trichomes on the upper leaflet surface, or if the calyx bore more macroscopic trichomes. Those specimens without remnants of macroscopic trichomes on the upper surface, or which had nearly glabrate calices, were designated f. mariana.

DISTRIBUTION (Figure 89): The pubescent form is common in the state of Florida from north-central Florida southward.

F L O R I D A. 1835, Gray 2568 (S). ALACHUA: Gainesville, 12 Apr 1897, Crawford s.n. (PH). BREVARD: Carlton Terrace, Cocoa, 2 Jul 1936, Rhoads s.n. (FLAS); Indian River Drive N of Sebastian, 7 Oct 1961, Lakela 24744 (FLAS,GH). CITRUS: 6 Jun 1941, Murrill s.n. (FLAS). CLAY: near SE corner of Blue Pond, 5 mi (airline) N of Keystone Heights, S20, T7s, R23E, 3 Aug 1972, Ward et al. 8380 (FLAS). COLLIER: Marco

Island, 28 Jun 1958, Atwater s.n. (FLAS). DADE: S of Miami River, 23 Jun 1915, Small, Moiser, & Small 6432 (FLAS,GH,MO,NY,PENN-2 sh.,S); Miami, 9 Mar 1917, Meredith s.n. (PH). HILLSBOROUGH: Tampa, 29 Jul 1898, Ferguson s.n. (MO). LAKE: vic of Eustis, 1-15 Jun 1894, Nash 913 (PH,PR) and 956 (E,F,G-2 sh.,GH,MICH,MO,NY,UC); l.c., Jun-Jul 1894, Hitchcock s.n. (F,FLAS,MO); 6 mi N Leesburg, 1.7 mi E of alt. US 441, 13 Apr 1975, Baltzell 7179 (FLAS-unmounted); Leesburg, Jun 1940, Meebold 27678 (M-mixed). LEVY: Rosewood, Garber s.n. (F-2 sh.,FLAS, PH). MANATEE: Palmetto, 7 May 1932, Weber s.n. (FLAS). MARION: Ocala Nat. Forest, 12 Sep 1929, O'Neill s.n. (FLAS); l.c., ca 1.5 mi SW of Central Tower, 24 mi E of Ocala, S23, T15S, R25E, 7 Apr 1974, Ward 8772 (FLAS); Ocala Nat. Forest, 4.1 mi E of Eureka Bridge via FLA 316 at junction with S.R. 88, opposite Hunt Hdqr., 30 Jun 1975, Fantz 2011 (Fantz Hb. VSC) and l.c., 0.4 mi N of FLA 316 via S.R. 88, 2012 (Fantz Hb.); Weirsdale, 7 May 1928, West s.n. (FLAS); 9.9 mi NE of Weirsdale, 1.2 mi N of FLA 42, 27 Jun 1976, Baltzell 8657 (FLAS-unmounted); 10.3 mi NE of Weirsdale, 1.6 mi N of FLA 42, 8 mi W junction FLA 42 and 452, 27 Jun 1976, Baltzell 8648 (FLAS-unmounted) and 0.7 mi W of junction FLA 42 and 452, 8650 (FLAS-unmounted). OKEECHOBEE: Okeechobee region, 2 Jul 1903, Fredholm 5868 (GH). ORANGE: 11 Jul 1902, Fredholm 5386 (GH); Lake Brantley, 21 Jun 1894, Lewton s.n. (NY); 6 mi N of Orlando, 7 Mar 1941, Murri1l s.n. (FLAS). POLK: 11 Jun 1894, Ohlinger 87 (all mixed: F,FLAS,MO); Winter Haven, 7 May 1931, McFarlin 5120 (MICH) and 9 May 1926, 678 (FLAS); 4 mi E of Lake Hamilton via 544, 12 Aug 1964, Conard s.n. (FLAS,GH). PUTNAM: Welaka, 6 Jun 39, Doud s.n. (FLAS). SEMINOLE: Sanford, 26 Aug 40, Crevasse s.n. (FLAS); 7.5 mi W of Sanford, 19 Jun 1975, Baltzell 7399 (FLAS-unmounted); 5 mi W of

Altamonte Springs, 2 May 1969, Baltzell 1069 (FLAS). VOLUSIA: Deland, Darkness s.n. (MO); l.c., Mar-Apr 1918, Perkins s.n. (GH); l.c., W Minn. Ave., 30 Jun 37, Cleef s.n. (FLAS); Orange City Junction, 30 May 1904, Eaton s.n. (F); Blue Prings, 27 Aug 1911, Hood s.n. (FLAS-2 sh., MO); Daytona Beach, 26 Jul 1935, Hume & Hume s.n. (FLAS-3 sh.); 0.8 mi N Osteen via 415, 19 Jun 1975, Baltzell 7411 (FLAS-unmounted).

42b. Clitoria mariana L. var. orientalis Fantz, var. nov.

Clitoria grahamii ("Clitoria grahami") Steud. ex Benth.,

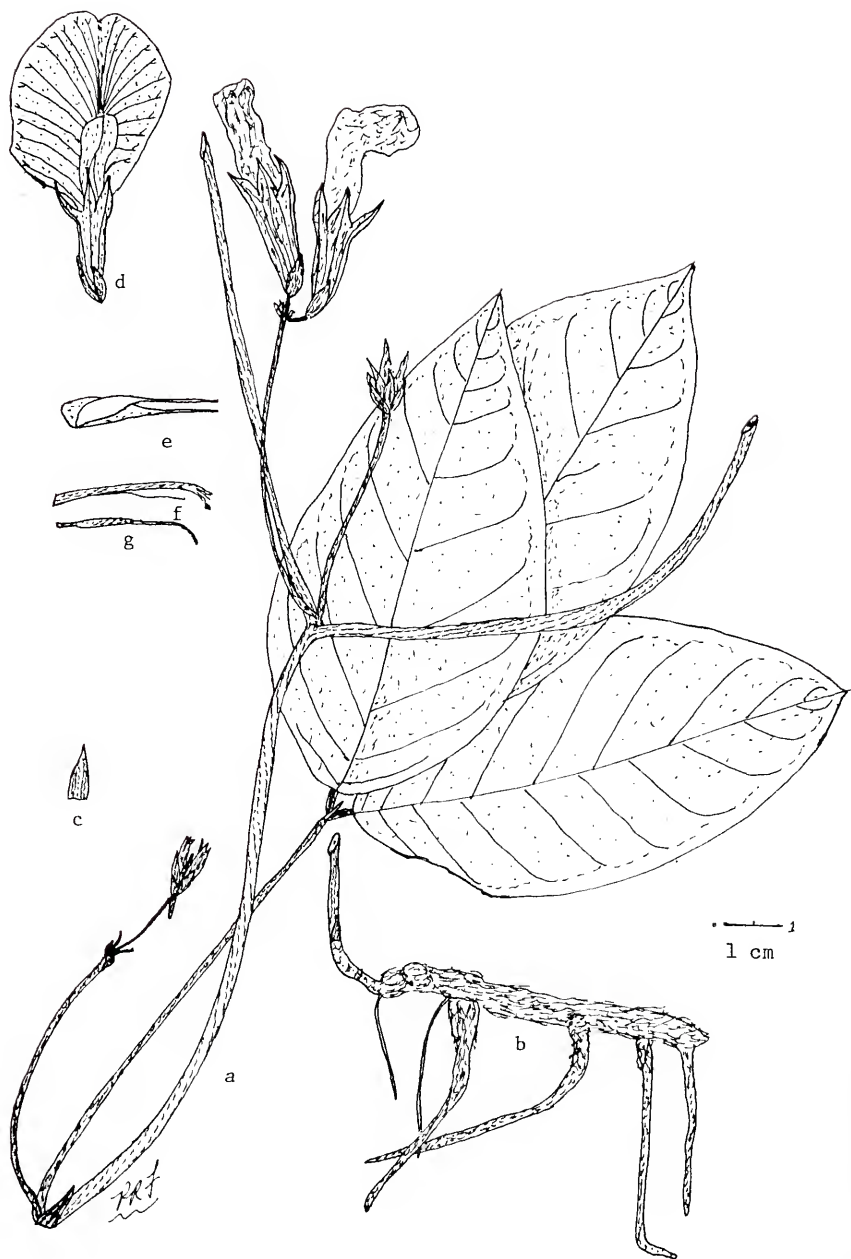
in Junghuhn Pl. Jungh. 2: 232. 1852; p.p. maj.

Suffrutescent herbaceous vine, stem trailing to climbing, twining. Leaflets 4-11.5 cm long, (1.5) 2-4 (6.5) cm wide, primary nerves of 9-12 pair. Stipules 6-10 mm long, 3-5 mm wide. Petioles 4-10 cm long. Inflorescence solitary or paired, typically 1-6.5 cm long or occasionally elongated, 6-10 (15) cm long, 2- to 4- (rarely 6- to 8-) flowered; axis slender, subtwining to slightly stiff, often arcuate. Flowers 4-5 cm. Vexillum claw 6-8 mm. Alae extended beyond carina 3-5 mm, blade 13-16 mm long, 3-6 mm wide, claw 11-14 mm. Carina 8-10 mm long, 3-4 mm wide, claw 14-18 mm. Gynophore 2-4 mm; ovary 7-8 mm; style 14-17 mm. Legume 2.5-4 cm long, stipe 5-8 mm, legume bearing 1-4 seeds per pod. Cleistogamy absent (or possibly unknown). Figure 91.

The southeast Asian variety of C. mariana is easily recognized by its distribution and the slender, elongated inflorescences with slightly smaller flowers, smaller, less showy wings, short stipe, broader stipules and bracteoles, and usually more robust appearance.

Figure 91. *Clitoria mariana* - III. Var. *orientalis*: (a) portion of twining stem, x 1; (b) xylopodium, x 1; (c) stipule, x 1; (d) flower, x 1; (e) androecium, x 1; (f) gynoecium, x 1. (Garrett 394, BM-Hb. Kerr: b-g. Stocks s.n., M 12417: a.)





PHENOLOGY: Specimens with flowers have been collected from mid May through September. The few fruiting collections were made from November through mid October, with one collection having juvenile fruits collected near the end of May.

TYPE COLLECTION: CHINA. Yunnan: Szemao, 5500 ft, Henry 12242 (HOLOTYPE: E-50. Isotypes: K-38, MO 107074, NY-Hb. Henry).

The collection selected as the type is a representative collection of the variety. The Edinburgh specimen has a mature, viney section of the stem with the typical broader stipules, longer-petiolate leaves, and slender, 4-flowered inflorescences which are slightly elongated. The specimen deposited at the Missouri Botanical Garden is similar, whereas those specimens from Kew and New York Botanical Gardens have the lower stem portions, with smaller leaves, shorter-petiolate, and shorter inflorescences. Henry 12242A collected at the same site, but at a lower elevation, is designated as a paratype.

Most collections have the flowers glued to the herbarium sheet, making examination of the flower difficult. Garrett 394 (BM) has a dissected flower in the packet that is representative of the variety. This specimen also is designated as a paratype.

NOTES: Young plants of var. orientalis have the lower stem with weakly zigzag internodes, to nearly straight internodes. The stem is suberect to nearly prostrate, with the upper stem portion soon exhibiting the twining appearance. Xylopodia collected appear similar, although not as thick in diameter, and less woody than the American variety. Lower leaves have shorter petioles, and the leaflets are similar in size to the American variety. Climbing portions often exhibit much larger leaflets and longer petioles. Also, there is a

difference in the inflorescence. Inflorescences of lower nodes have somewhat stiff, shorter axes, often 2-flowered at the apex. These inflorescences resemble the American variety. Upper nodes frequently bear more slender, somewhat twining, elongated axes, usually 4-flowered or occasionally to 8-flowered. Gradations can be observed between these apparently distinctive types. Rarely, highly elongated inflorescences occur.

Bentham (1858) noted the Asian element in his treatment of C. mariana and commented upon the luxuriant nature of these plants when compared to the American members. Bentham did not comment on other structures. The flowers average slightly smaller in the Asian members, but the alae and carina are noticeably smaller. The alae are more easily seen in the pressed flowers glued to the herbarium sheets than the hidden carina. These wings have a smaller blade and project only slightly beyond the carina. The gynoeceium has a shorter gynophore, which results in a short-stipitate legume. The legumes average slightly shorter, and with fewer seeds produced per pod.

Many of these same characteristics are used to distinguish between species of Clitoria, but in those instances, many other differences also occurred. In this case, the Asian members agree with the American members in number of structures, with most of the differences which occur being slight differences in the sizes of the structures. Therefore, although widely disjunct, the differences which occur do not indicate two distinct species, but rather one species with two subspecific entities.

This variety is sometimes confused with C. macrophylla which is distinguished by the elongated calyx lobes, subequal to longer than the

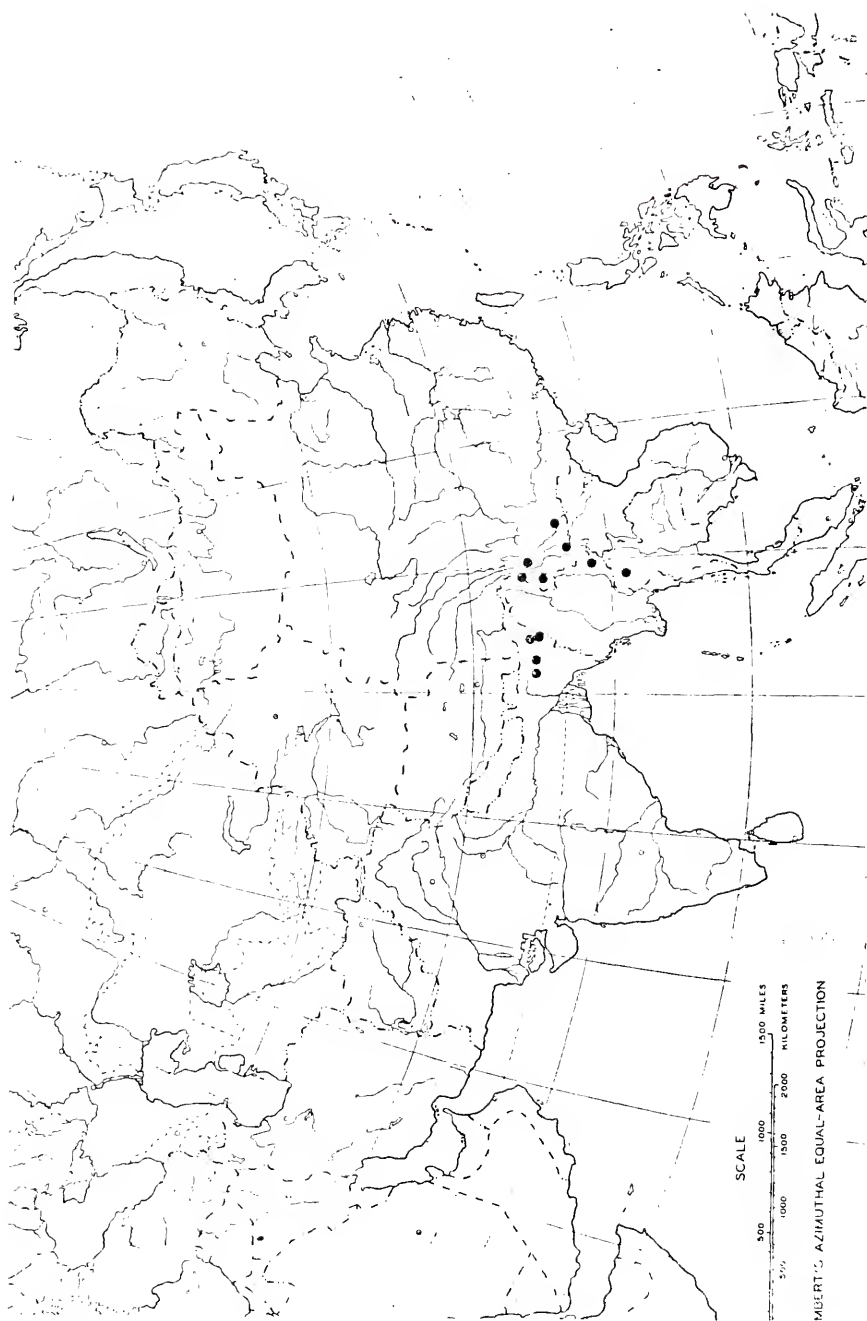
calyx tube, the very dense uncinat-pubescent and pilose calyx tube, shorter staminal tube, smaller white flowers, and longer legume. Vegetatively, both C. mariana and C. macrophylla can appear similar in appearance.

DISTRIBUTION (Figure 92): Variety orientalis is found in southeast Asia, widely disjunct from var. mariana of the eastern United States, from eastern India (Assam) to southern China (Yunnan). The plants are commonly found on forested mountain slopes at elevations of 3500-7000 (9000) ft.

L O C A L I T Y U N K N O W N. Nunklow, Lauions 68 (K).

I N D I A. ASSAM: Khasiya, Griffith 343 (BM,CGE,K); Khasiya Hills, Lobb s.n. (CGE); l.c., 4500 ft, Lobb s.n. (K); Khasia, 5000-6000 ft, Hooker & Thomson s.n. (BM-2 sh.,CGE-2 sh.,E,F,G-2 sh.,GH,K-4 sh.,M,MO, NY,S,U,US,W-3 sh.); l.c., Vale of Rocks, 5000 ft, 21 Sep 1886, Clarke 45222B (G); l.c., Moflong, 5000 ft, 15 Oct 1867, Clarke 6082 (BM); Khasia, Tsillong, 5000 ft, 14 Oct 1867, Clarke 5770 (K); Shillong, 5200 ft, 13 Jun 1886, Clarke 44094C (G) and 44094B (BM); l.c., 5200 ft, 13 Jun 1886, Clarke 44102A (G); Shillong, 5000 ft, 13 Jun 1923, Ruse 161 (A); l.c., Bishop's Falls, 4500 ft, 26 Sep 1885, Clarke 40549 (BM); Upper Shillong, Umasai, 25 Jun 1943, Sinclair 3007 (E); Upper Shillong, Kohima, 5500 ft, 28 Oct 1885, Clarke 41746A (K); Kohima, Naga Hills, 4500 ft, Jun 1886, Prain s.n. (BM,K); Jawai, 5000 ft, Sep 1882, Mann s.n. (E,U,W); Naga Hills, Lakema, 4500 ft, 16 May 1935, Bor 2642 (K); Naga Hills, Bainaho, 6000 ft, 13 Jul 1935, Bor 5083 (K); Lushai Hills, Tuisinhau, 4000 ft, Jul 1926, Parry 76 (K); Pomrang, 17 Sep 50, Anonymous s.n. (K); Ukru1, 5000 ft, 1 Jun 1948, Kingdom-Ward 17562 (NY); ?--Pau1, Sep 50, Anonymous 1373 (K).

Figure 92. Asian distribution of Clitoria mariana var. orientalis,  
section Mexicana.



B U R M A. Valley of Naung Chaung, upper Burma, 4000-5000 ft,  
23 Jun 14, Kingdom-Ward 1698 (E-2 sh.). KACHIN STATE: Htawgaw, 5000 ft,  
17 Sep 19, Kingdom-Ward 3647 (E); l.c., N of Htawgaro, 26°10'N-98°25'E,  
5000-6000 ft, Jun 1924, Forrest 24551 (E,K,NY,W). SHAN STATE: Kung  
Tung, 4000 ft, Sep 09, MacGregor 2 (E).

C H I N A. YUNNAN: hills to N of Tengyueh, 25°15'N, 6500 ft, May  
1912, Forrest 7767 (E-2 sh.,K,S); l.c., 6000-7000 ft, Aug 1919, Forrest  
18258 (BM,E,K,W); Tali Range, 25°40'N, 9000 ft, Jul 1913, Forrest 11697  
(BM,E,UC,W); SE mt forest of Mengtsz, 5000 ft, Henry 11147 (K,M0);  
Szemao, 4500 ft, Henry 12242A (PARATYPES: NY-2 sh.); l.c., 5000 ft,  
Henry 12507B (K-mixed); Tengyueh, Howell 122 (E,K) and 193 (E); Fo Hai,  
1540m, 1935-36, Wang 74489 (A); Nan Chiao, 1450 m, 1935-36, Wang 75244  
(A).

T H A I L A N D (SIAM). NORTH: Doi Sutep, Chiangmai, 10 Jun 1958,  
Sørensen, Larsen, & Hansen 3628 (K); l.c., 1400 m, 25 May 1905, Hosseus  
536a (M); l.c., 4000-5000 ft, 4 Jun 1909, Kerr 671 (BM,K); Doi Nang Ka,  
Chiangmai, 2 Nov 1930, Putt 3321 (BM,K); l.c., 11 Nov 1960, Putt 3424  
(BM); Doi-Angka, Doi Pa-Mawn, 1640 m, 30 Jun 1927, Garrett 394 (PARATYPE:  
EM); Doi Hua Mot, 15 Aug 1934, Smith 665 (UC); Diwangiri-Trashigung  
Road, 3500 ft, 24 Jun 34, Ludlow & Sheriff 548 (BM).

Section Tanystyloba

IIb. Clitoria L. subg. Neurocarpum (Desv.) Baker emend. Fantz  
sect. Tanystyloba Fantz, sect. nov.

Leaves 3- and 1-foliolate, subsessile to petiolate. Inflorescence axillary, 1-4 per node, racemose, contracted, 0.3-1.5 (3) cm long; peduncle 0.2-1.5 (2) cm; rachis internodes 0.1-1.0 cm. Chasmogamous flowers small, 2.5-4.5 cm, white. Calyx tube short, 6-12 mm, lobes subequalling to conspicuously longer than the tube, (7) 8-15 mm long; pubescence of calyx densely uncinata with conspicuous subappressed to spreading trichomes, moderate to dense. Staminal tube short, 1.3-2.2 cm. Style short, 1.1-1.6 cm. Cleistogamous flowers absent. Legume weakly depressed between the seeds, ecostate, uncinata-pubescent to glabrate. Seeds slightly wider than long.

Members of section Tanystyloba can be characterized by their calyx which is densely uncinata-pubescent beneath long, white, conspicuous subappressed to spreading trichomes, and calyx lobes subequalling to longer than the calyx tube. The small, white flowers borne on contracted inflorescences, an ecostate legume which is weakly depressed between the seeds, and the absence of cleistogamy are characteristics of this section.

PHENOLOGY: Members of section Tanystyloba have short seasons and are collected with flowers or fruit from July through October. Most collections are made in July and August.

HOLOTYPE SPECIES: C. macrophylla Wall. ex Benth. (non Hance).

Most of the species in this section were described after Benthams revision (1858). This relative length of the calyx lobes as compared with the calyx tube is rarely noted in this descriptions. Yet this



characteristic of an elongated calyx lobe, subequalling to longer than the tube, is unique to section Tanystyloba. The calyx lobe is typically deltoid-ovate at the base with a long acuminate apex. The lobe commonly is 1-4 (5) mm longer than the length of the calyx tube. In other sections (including those of other subgenera), the calyx lobe is typically shorter than the tube, or infrequently nearly equal in length to the tube.

The pubescence of the calyx is also distinctive for this section. Uncinate trichomes do occur on calices of members of other sections, but not as dense as in the calices of members of section Tanystyloba. The calyx tube is often dark-shaded, and the mass of uncinat trichomes, white in color, are very conspicuous, even at lower magnifications (i.e. 10 x). These trichomes have often been noted in descriptions as "puberulent pubescence." The macroscopic trichomes are even more conspicuous. They are white, quite long (1-2.5 mm), subappressed to spreading, and usually arranged in a moderate to dense pattern, especially along the ventral and dorsal margins. Members of other sections usually have calices with inconspicuous to slightly conspicuous, uncinat trichomes which are observed better at higher magnifications (i.e. 20-30 x), and with macroscopic trichomes that are few in number, more scattered, and often shorter.

Many of the characteristics of section Tanystyloba indicate that its members have a close affinity with members of section Mexicana and not with Neurocarpum. The legumes are ecostate and depressed between the seeds. The seeds are slightly wider than long. The flowers are small and white-colored. The calyx tube is short, as is the staminal tube and style. These characteristics all agree with section Mexicana.

Section Tanystyloba is distinct in that there are no cleistogamous flowers by any of its members. Specimens which contain cleistogamous flowers are usually collected with fruits. Fruiting specimens of species in section Tanystyloba are not as numerous as those in section Mexicana or section Neurocarpum, but from those examined, no cleistogamous flowers were observed. Although normally inconspicuous, cleistogamous flowers can be viewed easily with the naked eye, especially when one is searching for them. The persistent, minute calyx is easily discernible on fruiting specimens, indicating the cleistogamous flowers. It is presumed, until evidence is obtained to the contrary, that cleistogamy is absent in these species.

DISTRIBUTION (Figure 12): Members of section Tanystyloba are found in southeast Asia, from eastern India to southern China, south to Indo-China, with one species in the Arnhem territory of northern Australia. One species (C. javanica) is historically attributed to Java, although the single specimen cited was probably a cultivar. The species are typically found in mountain forests as undershrubs or vines, usually in wetter habitats than species of sections Mexicana and Neurocarpum.

#### KEYS TO SPECIES:

1. Flowers 3.5-4.5 cm; bracteoles (7) 8-12 mm; ovary 8-9 mm; bracts (4) 5-7 mm; calyx tube 9-12 mm; style 13-16 mm; calyx lobes 3-4 mm wide at their base (India, Burma, Thailand, Vietnam). . 43. C. macrophylla
1. Flowers 2.5-3.5 cm; bracteoles 4-8 mm; ovary 6-8 mm; bracts 3-5 mm; calyx tube 6-10 mm; style 11-14 mm; calyx lobes 2-3 mm wide at their base.
2. Calyx lobes subequalling tube length; staminal tube 17-21 mm; ala blade 12-15 mm long; leaves petiolate, petiole 3-6 cm;

leaflets slightly elongate to suborbicular, ratio of length/width is 1-1.5:1; herbaceous vines.

3. Leaflets 3-foliate only; leaflets small, 3-5 (7) cm diameter; petiolule 3-4 mm; carina 6 mm long; inflorescence 4- to 6-flowered; stipule width 3-4 mm; stipels 3-6 mm long; rachis present, 1-2 cm (Thailand). . . 44. C. javanica
3. Leaflets 1-foliate only; leaflets large, 7-10 cm diameter; petiolule 4-6 mm; carina 10 mm long; inflorescence 1- to 2-flowered; stipule 1.5-2 mm wide; stipels 6-8 mm long; rachis lacking (Thailand). . . . . 45. C. cordiformis
2. Calyx lobes longer than the tube length; staminal tube 13-18 mm; ala blade 7-11 mm; leaves sessile to short-petiolate, petiole 0.3-3 cm; leaflets elongated, ratio of length/width is 2-5:1; subshrub to suffrutescent herbs, erect (rarely subclimbing).
4. Leaflets narrow, 0.8-2 cm wide; primary nerves of leaflets ca 18 pair; petiole longer than rachis; carina 8 mm long; leaves 3-foliate only (Laos) . . . . . 46. C. linearis
4. Leaflets broadened, 2-5 (8) cm wide; primary nerves of leaflets 8-13 pair; petiole shorter than rachis; carina 5-7 mm; leaves 3-foliate with occasional 1-foliate leaves borne at lower nodes.
5. Flowers 3-3.5 cm; ala blade 7-8 mm; carina blade 6-7 mm; ovary 7-8 mm; stipule 3-4 mm wide; calyx tube 7-10 mm; staminal tube 14-18 mm (China, Thailand, Cambodia, Vietnam). . . . . 47. C. hanceana

5. Flowers 2.5-3 cm; ala blade 10-11 mm; carina blade 5 mm; ovary 6-7 mm; stipule width 2-3 mm; calyx tube 6-8 mm; staminal tube 13-15 mm (Australia) . . . . . 48. C. australis

43. Clitoria macrophylla Wall. ex Benth., in Junghuhn Pl. Jungh.

2: 232. 1852; non Hance (1878).

Clitoria macrophylla Wall., Cat. no. 5345. 1831-32; nom. nud.

Clitoria acuminata Grah. ex Wall., Cat. no. 5346. 1831-32; nom. nud.

Clitoria grahamii ("Clitoria grahami") Steud., Nom. Bot. ed.

2. 1: 86. 1840; nom. nud.

Clitoria grahamii ("Clitoria grahami") Steud. ex Benth., in Junghuhn Pl. Jungh. 2: 232. 1852; p.p. min.

Subshrub to suffrutescent herb, erect to 80 cm tall, or apex arching toward ground, trailing to climbing, subtwining, to 2.5 m long. Stems subterete, longitudinally striated, 1-3 mm in diameter, unbranched to somewhat branched near base, pith hollow, internodes flexuous to arcuate-flexuous, 7-20 cm long on viney portions, 4-10 cm long on erect portions, juvenile stem pubescence uncinata and bearing subappressed to spreading, macroscopic trichomes, becoming scattered and appressed with age until nearly glabrate. Xylopodium infrequently collected, subterranean, lignose, apex knobby from which aerial stems arise, bearing one (occasionally up to four) thickened, cylindrical portions 3-7 cm long, 5-9 mm wide, from which filiform portions arise at their distal end, 1-2 mm in diameter, exceeding 15 cm (broken off) long, and

bearing rootlets. Leaves 3-foliate, or rarely 3-foliate with 1-foliate leaves at lowermost nodes, becoming subcoriaceous, leaflets variable, oblong, elliptic-oblong, lanceolate, oblanceolate-oblong, ovate, elliptic-ovate, apex generally obtuse and abruptly short-acuminate (to 0.5 cm), occasionally tapered and acuminate, mucronate to 1 mm, base broadly cuneate to rotund (1-foliate leaves with rotund to subcordate base), midrib subimpressed in groove above, primary nerves of 10-14 pairs, to 17 pairs on elongated leaflets, upper surface dark green, glabrous, or occasionally uncinat-pubescent along midrib, lower surface sericeous to scattered pubescent with short, subappressed trichomes, pale green to green; leaflets of 3-foliate leaves 5-11 (14) cm long, 2.5-6 (rarely 7) cm wide; 1-foliate leaves 10-16.5 cm long, 5-8 cm wide. Petioles 2-9 cm, pubescence dense, pilose-strigose, becoming glabrate, those of unifoliate leaves typically 5-9 cm; rachis (1.5) 2-4 cm. Petiolules rugose, 4-5 (6) mm, pubescence of subappressed to spreading trichomes. Stipules ovate-lanceolate to deltoid-lanceolate, acuminate, strigose, 5-10 cm long or occasionally 12-18 cm long, 2-5 cm wide; stipels of 3-foliate leaves lanceolate to linear, long-acuminate, 3-9 mm long, to 1 mm wide, terminal stipel much shorter than lateral stipels, stipels of 1-foliate leaves typically 10-16 mm long, 1-1.5 mm wide. Inflorescence axillary, contracted, 0.5-2 (3) cm long, (2-) 4- to 6-flowered, crowded, (1) 2-4 fascicled; peduncles 3-13 (20) mm, pubescence uncinat beneath the subappressed to spreading macrotrichomes. Pedicels 3-6 mm. Bracts ovate, acuminate to acute, pubescence uncinat and pilose-strigose; inner pair caducous, 2 mm long, 1 mm wide; middle pair persistent, 4-7 mm long, 1.5-2 mm wide, spreading to reflexed with age; outer bract deciduous, 3-5 mm long, 1 mm wide. Bracteoles lanceolate, acuminate,

7-12 mm long, 2-3 (4) mm wide, borne to 1 mm below calyx, pubescence uncinata, pilose, ciliate. CHASMOGAMOUS FLOWERS white, diminutively medium-sized, 3.5-4.5 cm long, (to 5.5 cm in only one collection, Kostermann 1275). Calyx dark-shaded in dry state, bearing dense, conspicuous (20x) uncinata pubescence beneath the spreading, elongate, white trichomes conspicuous to the naked eye, tube 10-nerved, each nerve prominently raised and extending to a sinus or lobe apex, tube 9-12 mm long, 2-4 mm wide at base expanding to 5-7 (8) mm wide at throat, lobes ovate-lanceolate, long-acuminate, 3-nerved, ciliate, 9-15 mm long, subequalling the tube length or typically exceeding it by 1-3 mm, lobes 2-3 (4) mm wide at base, ventral lobe 11-17 mm long. Vexillum conspicuously moderately to densely pubescent, strigose, blade 2-3 cm wide, claw 4-5 mm. Alae extended beyond carina 4-5 mm, blade 13-15 mm long, 4-6 mm wide, claw 8-11 mm. Carina subfalcate, oblique on claw, 7-8 mm long, 3-4 mm wide, claw 13-16 mm, uncinata-pubescent. Staminal tube 17-22 mm, vexillary stamen coherent near middle, free filaments 1-3 mm; anthers 1-1.3 mm long, 0.7-1 mm wide. Gynophore ca 3 mm, uncinata-pubescent; ovary 8-9 mm long, 0.7-0.9 mm wide, pubescence dense, uncinata, rarely bearing a few long trichomes near the base along the sutures; style 13-16 mm, geniculate 4-5 mm from the distal end; stigma capitate. Legume short-stipitate, convex, ecostate, weakly depressed between seeds, brown, (rarely 3) 4-5.5 (6) cm long, 7-9 mm wide, pubescence uncinata or that of juvenile legume uncinata and becoming glabrate with scattered, remnant, uncinata trichomes; stipe enclosed within calyx along with legume base, 6-9 mm long, 1 mm wide expanding to 3 mm at apex; beak 2-7 mm; dehiscence causing valve to twist 0.5-1.5 turns. Seeds slightly longer than wide, dark

brownish-black, viscid, 4-4.5 mm long, 4-5 mm wide, 2-3 mm thick, 4-8 seeds per pod. CLEISTOGAMOUS FLOWERS absent. Figure 93 and 94.

Wallich's Clitoria is characterized as a suffrutescent herb with white flowers of medium-size having a calyx with the lobes longer than the tube, elongated bracteoles, and fruits weakly depressed between the seeds. The specific epithet "macrophylla" is somewhat misleading because there are other species within subgenus Neurocarpum that have longer and/or broader leaflets, as well as almost all members of the subgenus Bractearia. Of the species cited by Wallich (1831-32) from southeast Asia, C. macrophylla had the larger leaves, hence his choice of a name.

PHENOLOGY: The flowering and fruiting season of this species is apparently from late June through early November, with the peak production occurring in July and August. Only one collection was made with flowers occurring in June (the 25th). One collection (Collins 1441) reported flowers collected in mid October with fruits collected November 10th. A collection of late December bears almost denuded nodes and dehiscent fruits.

TYPE COLLECTION: BURMA. Pegu: Mount Prome, Wallich Hb. 5345 (LECTOTYPE: K-hb. Bentham. Isolectotypes: BM).

Wallich (1831-32) published the name C. macrophylla as a nomen nudum, citing it under the number 5345. Two decades later, Bentham (1852) validated the publication of the name by including a description, and citing the Wallich 5435 collection. Of the two known specimens from the type collection, the Kew specimen was chosen as the lectotype because it was the more probable one Bentham examined, and it consists of better material, including flowers, fruits, and seeds. A second

Figure 93. Clitoria macrophylla - I. Var. macrophylla: (a) one node of stem with leaf and inflorescences, x 1; (b) flower, x 1; (c) calyx, x 1; (d) vexillum, x 1; (e) ala and carina, x 1; (f) androecium, x 1; (g) gynoecium, x 1; (h) legume, x 1; (i) three views of seed, x 1. (Wallich 5345, K-7, hb. Bentham: a-c,h-i. Parish 11, K-92, hb. Hooker: d-g.)



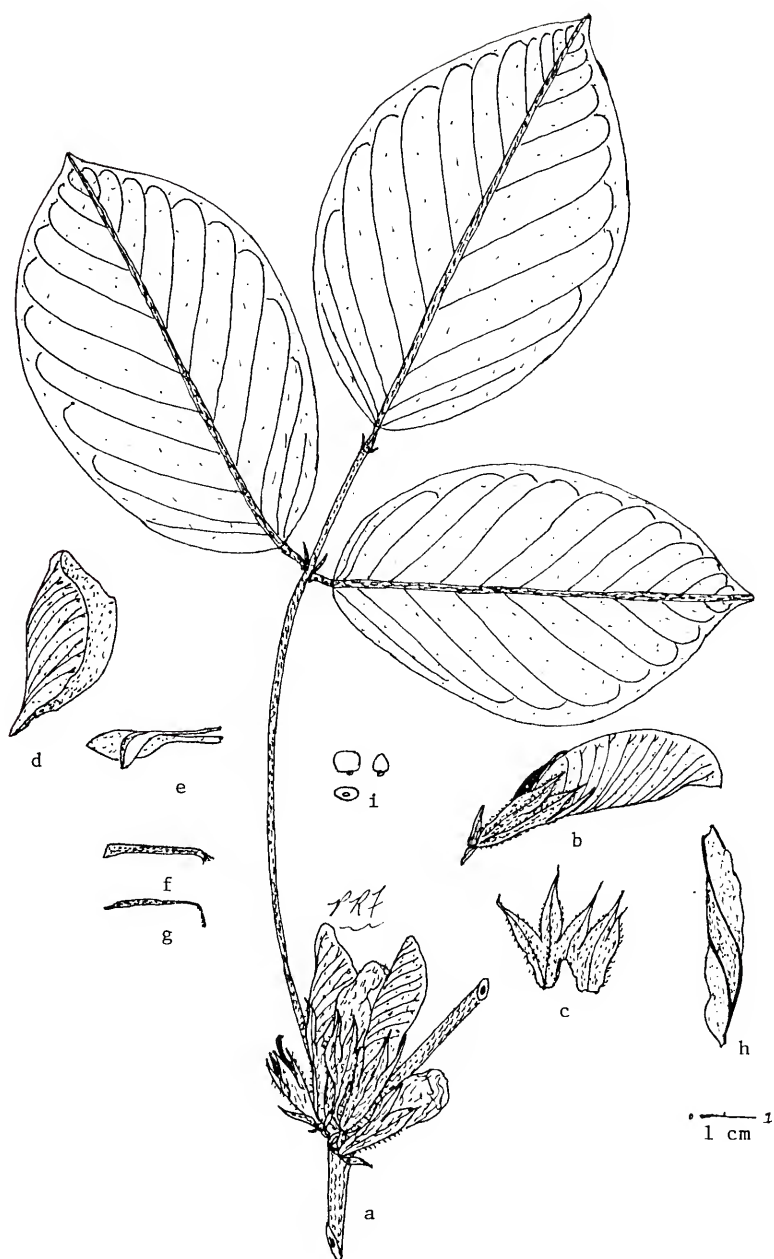
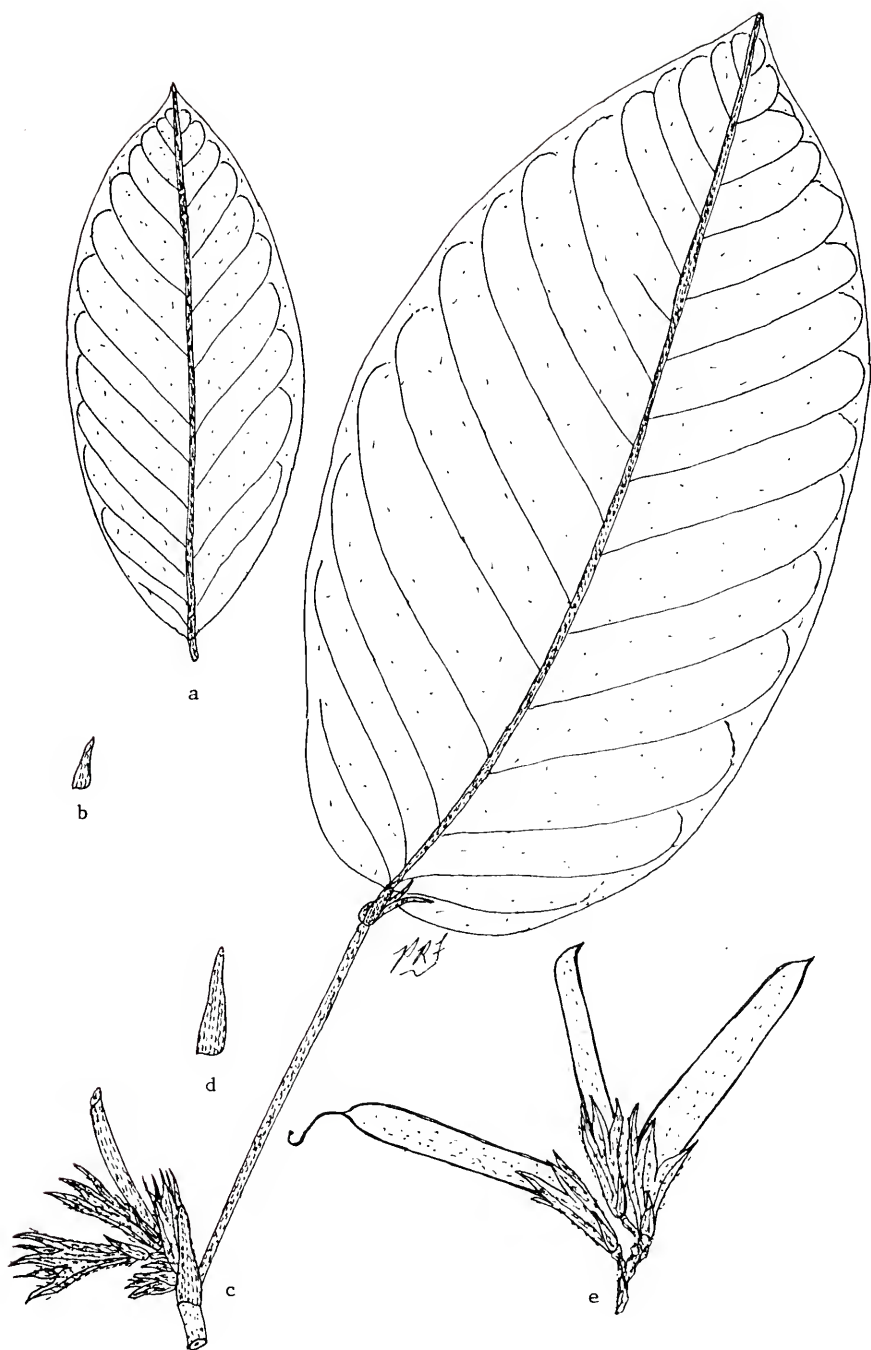


Figure 94. Clitoria macrophylla - II. Var. sericea: (a) leaflet, x 1; (b) stipule, x 1. Var. stipulacea: (c) one node with unifoliate leaf and inflorescence, x 1; (d) stipule, x 1. Var. macrophylla: (e) inflorescence with immature fruit, x 1. (Put 4085, K-118: a-b. Winet 360, E-97: c-d. Helper 1837, K-91: e.)



specimen has been kept within the type folder at Kew along with Wallich 5345. This specimen bears the data "Prome or Paong pong, Wallich 5345B." This specimen may or may not be a duplicate of the type collection (the designation by the letter "B" indicates that it probably is not a duplicate), and may have or may not have been examined by Bentham and included in his description.

Clitoria acuminata Graham ex Wallich and C. grahami Steud. have historically been synonymized with C. mariana L. However, the type specimens agree with C. macrophylla. Clitoria acuminata Grah. ex Wall. was published as a nomen nudum, with the type collection being Wallich hb. 5346 (BM! K-hb. Bentham!). Steudel (1840) changed the name to C. grahami, citing "C. acuminata Grah. in Wall." in synonymy. With the type specimens agreeing with C. macrophylla by having elongated calyx lobes longer than the calyx tube, a densely uncinat and pilose pubescence, and longer fruits (than those of C. mariana), these two names should be placed in synonymy with C. macrophylla. It should be noted that Steudel's name, C. grahami, is orthographically incorrect in accordance with the present International Code of Botanical Nomenclature (1972), and should be corrected to C. grahamii Steud. in accordance with the provisions of Art. 73.

Bentham (1852) published the first description of C. grahamii, validating the name. He based the description on two collections, Wallich 5346 and Khasiya, Griffith. The description is based primarily on the Griffith specimen which agrees with C. mariana L., not C. macrophylla Wall. ex Benth. Bentham commented on the calyx teeth being shorter than the tube, and that the legume was shorter than those found in C. macrophylla. Both of these diagnostic characteristics disagree

with the Wallich 5346 specimens, which have the calyx lobes slightly longer (1-3 mm) than the tube, and whose immature legume agrees with C. macrophylla, being longer than those typically found in Asian individuals of C. mariana. In addition, the calyx pubescence does not agree with the nearly glabrate calyx of C. mariana. Therefore, C. grahamii Steud. ex Benth. is based upon two species, and the name is cited in synonymy under C. mariana as p.p. maj. (i.e. for the greater part because of the diagnostic portions of the description); the name is cited in synonymy under C. macrophylla as p.p. min. (i.e. for a small part since the specimens disagree with the diagnostic characteristics).

VERNACULAR NAME: THAILAND (CENTRAL): Poik tak katên, Put 88.

ECONOMIC IMPORTANCE: This species is used locally as a natural pesticide in the Central Province of Thailand. Tubers are bruised and soaked in water, then sprayed on plants to kill green flies in pepper gardens (Collins 1441, K-113). Root juice is used for killing worms in buffalo's backs (Collins 1441, US 1701228).

NOTES: The habit and leaflets of C. macrophylla are variable, causing confusion with the Asian members of C. mariana (var. orientalis) which are sometimes somewhat similar in their vegetative aspects. Clitoria mariana can be distinguished by its nearly glabrate calyx, calyx lobes shorter than the tube length (by 4-6 mm typically), shorter bracts (3-4 mm), longer staminal tube (21-26 mm), and shorter fruits (2.5-4 cm). Vegetatively, C. mariana typically has a shorter rachis (1-2 cm), shorter petiolule (3-4 mm), and less primary nerve pairs (9-12) in the leaflets. The tapered, acuminate apex of the leaflet cited frequently as a diagnostic characteristic for distinguishing these two species, is an infrequent characteristic found in both species. Both

species more typically bear leaflets with broadly acute to obtuse apices with a short acumen.

Hance (1878) described C. macrophylla from China. This specimen was misidentified, and the species it represented is now known as C. hanceana, which is also often confused with C. macrophylla. Clitoria hanceana is easily distinguished by the sessile to short-petiolate leaves (petiole 0.3-2 cm), smaller flowers (3-3.5 cm), smaller bracteoles (4-8 mm), somewhat shorter calyx tube (7-10 mm), shorter staminal tube (14-18 mm), shorter ala blade (7-9 mm), and a more shrubby habit.

Clitoria macrophylla has its closest affinities to C. javanica and C. cordiformis. Clitoria javanica has sometimes been included in synonymy under C. macrophylla, but it is a distinct species distinguished by the smaller bracteoles (5-8 mm), shorter calyx tube (8-9 mm) with the calyx lobes subequalling the tube length, smaller ovary (6-7 mm), 1-2-flowered inflorescences with slightly smaller flowers, and recognized vegetatively by the small, suborbicular leaflets (3-5 x 2-5 cm). Clitoria cordiformis, a new species, is separated easily from C. macrophylla by its 1-foliate, cordiform leaves, smaller bracteoles and ovary, and shorter calyx tube and bracts, with the calyx lobes being nearly equal to the calyx tube.

Despite the variation within the species, three varieties can be recognized based primarily upon vegetative characters which are somewhat consistent within each variety. Variety stipulacea and var. sericea have conspicuously pubescent lower leaf surfaces. These members are often confused with C. hanceana. Variety macrophylla often resembles members of C. mariana with which it is confused.

DISTRIBUTION (Figure 95): Clitoria macrophylla is distributed in southeast Asia from east India to Thailand, south to Cochinchina, although the majority of collections are from Thailand. Few collections give habitat data and elevations of collection, and these are confined to Thaiinese collections. Thailand members are found on mountain slopes at altitudes of 100-900 m in open evergreen and dry, deciduous, dipterocarp forests (or jungles) on gravelly to sandy soil.

KEY TO VARIETIES:

1. Leaflet pubescence on lower surface with scattered, appressed trichomes with trichomes well spaced and scarcely overlapping; leaflet shape variable, but typically ovate to oblong-ovate, often 1.5-2.5 times longer than wide; suffrutescent herb, somewhat erect with climbing apex, stem internodes elongate, 7-20 cm, upper internodes twining slightly; petioles somewhat elongated, 5-9 cm; calyx teeth somewhat short, 9-13 mm long, mature fruit glabrate or bearing scattered remnants of uncinat trichomes (India, Burma, Vietnam) . . . . . 43a. var. macrophylla
1. Leaflet pubescence on lower surface sericeous, moderate to dense, trichomes closely spaced, often overlapping; leaflet shape variable, but typically elongated, oblong, or lanceolate, elliptic-oblong, oblong-lanceolate, to oblanceolate-oblong, often 2-4 times longer than wide; subshrub, erect, stem internodes short, 4-10 cm, weakly to arcuate-flexuous; petioles short, 2-6 cm; calyx teeth elongate, 12-15 mm; fruit uncinat-pubescent.
2. Stipules 5-9 mm long, 2-4 mm wide; leaves 3-foliolate only, leaflets to 6 cm wide; stipels 3-9 mm (Thailand) . . . . .  
 . . . . . 43b. var. sericea

2. Stipules (10) 12-18 mm long, 4-5 mm wide; leaves 3- and 1-foliate, 1-foliate leaflets 6-8 cm wide; stipels of 1-foliate leaves 10-16 mm (Thailand) . . . . . 43c. var. stipulacea

43a. Clitoria macrophylla Wall. ex Benth. var. macrophylla.

Clitoria macrophylla Wall., Cat. No. 5345. 1831-32; nom. nud.

Clitoria acuminata Grah. ex Wall., Cat. no. 5346. 1831-32;

nom. nud.

Clitoria grahamii ("C. grahami") Steud., Nom. Bot. ed. 2,

1: 86. 1840; nom. nud.

Clitoria grahamii ("C. grahami") Steud. ex Benth., in

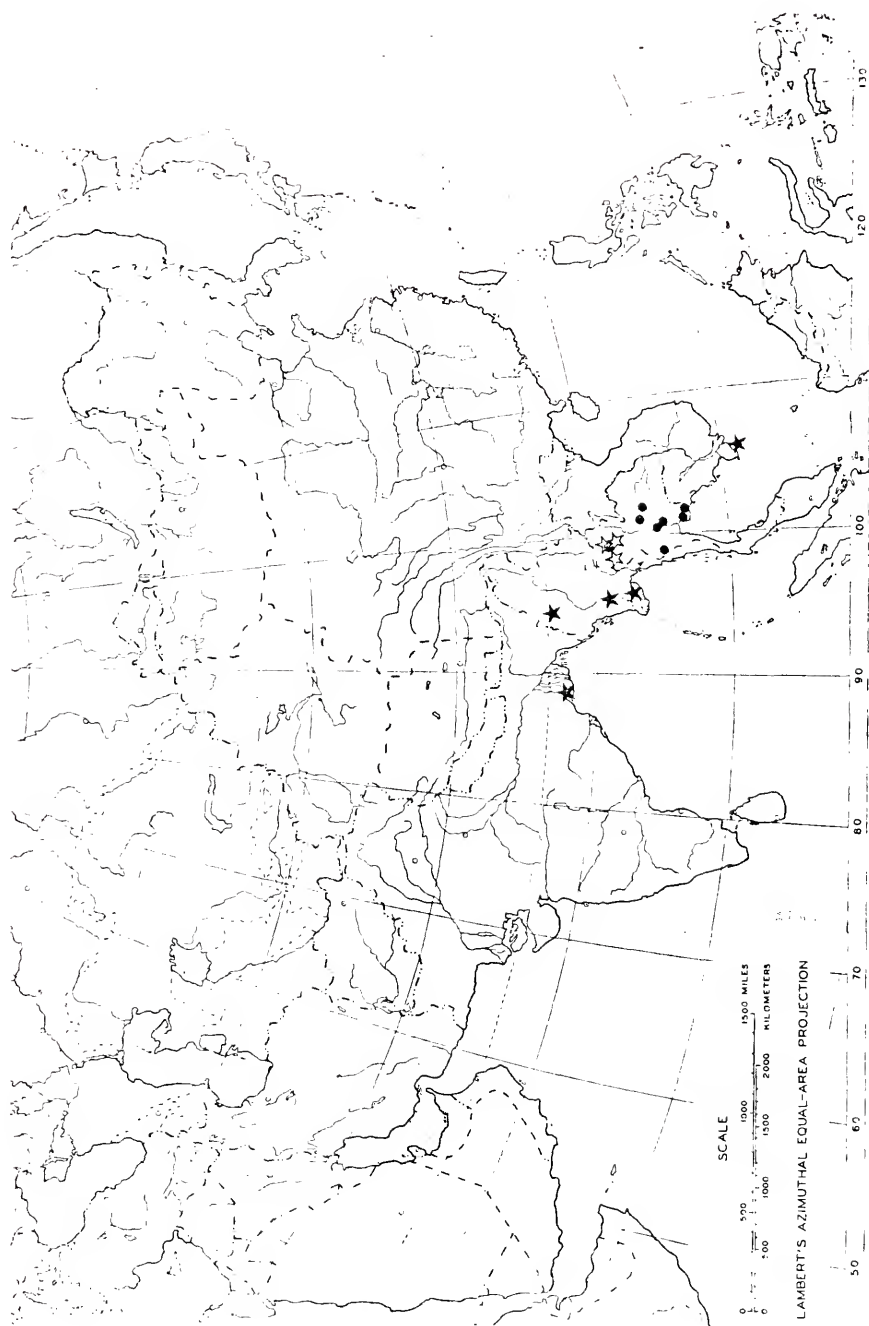
Junghuhn Pl. Jungh. 2: 232. 1852; p.p. min.

Suffrutescent herb with erect to lax stems, apex trailing to climbing, weakly twining. Leaves 3-foliate, leaflets ovate, elliptic-ovate, or occasionally lanceolate-elliptic, primary nerves of 9-12 (15) pairs, lower surface sparsely pubescent, trichomes subappressed, scattered; ratio of leaflet length/width is 1.5-2.5:1. Stem internodes weakly twining in upper portion of stem, typically 7-20 cm long. Stipules 5-9 mm long, (2) 3-4 mm wide. Petioles usually somewhat elongated, (4) 5-10 cm. Calyx lobes 9-13 (14) mm long. Legume pubescence uncinata as juvenile, becoming glabrate with scattered, remnant, uncinata trichomes.

DISTRIBUTION (Figure 95): The typical variety is found in east India and Burma, with two collections from Cochinchina. This variety is infrequently collected.



Figure 95. Asian distribution of Clitoria macrophylla, section Tanystyloba. Var. macrophylla (★); var. sericea (●); var. stipulacea (☆).



I N D I A. WEST BENGAL: India or., Helper s.n. (W); Bengali circa Calcutta, 1836-38, Helper 95 (A,BM,E,F-mixed,G,GH,NY,PR-3 sh.,S) and 179 (PR-2 sh.) and 206 (PR-2 sh.) and s.n. (PR-2 sh.).

B U R M A. Bithoko Range, 3000 ft, 1859, Brandis 178 (K) and 1308 (K). PEGU: Prome or Paong pong, Wallich 5345B (K); Dist. Insein, 23 Jul 48, Khant 574 (A). SAGAING: Maukkadaow, Upper Chindwin, 25 Aug 1908, Lace 4242 (E); Maubin, 19-?-75, Kuntze 6206 (NY). TENASSERIM: Tenasserim, 1861-62, Helper 1727 (GH,K) and 1837 (K); Martaban, 1859, Parish 11 (K-2 sh.).

V I E T N A M. COCHINCHINA: ad China chiang, Sep 1865, Pierre s.n. (E,K); Iles de Pulo Condor, 1875-77, Harmand 876 (A,BM).

43b. Clitoria macrophylla Wall. ex Benth. var. sericea Fantz,  
var. nov.

Subshrub to suffrutescent herb, erect. Stem internodes weakly to arcuate-flexuous, 4-10 cm long. Leaves 3-foliate, leaflets elongated, oblong or lanceolate, elliptic-oblong, oblong-lanceolate, oblanceolate-oblong, ratio of length/width is 2-4:1, primary nerve of (10) 13-17 pairs, lower surface sericeous, moderate to dense, trichomes falcate, erect, closely packed and overlapping. Stipules 5-9 mm long, 3-4 mm wide. Petioles typically 2-6 cm long. Calyx lobes elongate, (11) 12-15 mm. Legume uncinat-pubescent.

This variety is the one most commonly collected and recognized easily by its sericeous pubescence on the lower leaf surface and shortened stipules and stipels.

TYPE COLLECTION: THAILAND. Central: Hua Wai, Nakawn Sawan, 28 Aug 1931, Put 4085 (HOLOTYPE: K-118. Isotype: BM).

Put 4085 (K) is one of the few specimens with both flowers and fruits. Leaves are somewhat younger than other specimens, thus the leaflets are not as long, but they are basically oblong with a sericeous pubescence on the lower surface, short-petiolate, and borne on weakly flexuous stems. Fruits are uncinat. The paratype, Put 1850, has narrower, more elongated leaflets and more pronounced, flexuous internodes to the stem, representing the other end of the variation spectrum

DISTRIBUTION (Figure 95): This variety is the common one collected, an endemic of central and northern Thailand.

T H A I L A N D (SIAM). NORTH: Chiangmai, plain W of Taron, Alyran Ameraid, 380 m, 6 Aug 1924, Garrett 181 (BM,E,K); Chiangmai, Doi Sutep, 500-600 m, 27 Jul 1958, Sørensen, Larsen, & Hansen 4500 (A). CENTRAL: Kohn Din near Sriracha, 80 ft, 10 Nov 1926, Collins 1441 (K, US); Bartapan, 23 Dec 1927, Put 1341 (BM,K); Hin Dat, Kanburi, 1 Jul 1926, Put 59 (BM); l.c., 5 Jul 1926, Put 88 (BM,K); Sai Yok, Kanburi, 3 Aug 1928, Put 1850 (Paratypes: BM,K); l.c., 300 m, 3 Aug 1928, Marcant 2419 (Paratype: K); Hua Wai, Nakawn Sawan, 28 Aug 1931, Put 4080 (BM, K); Khwae Noi River Basin Exp., Ku-Jae, ca 150 km NW of Kanburi, 100-150 m, 20 Jul 1946, Kostermans 1275 (A); Thung Kra Mang, 16°15'N-101°30'E, 800-900 ft, 9 Aug 1972, Larsen et al. 31577 (E); Khao Phra Bat, N of Chanthaburi, 100 m, 15°52'N-102°10'E, 27 Aug 1972, Larsen et al. 32103 (E). NORTHEAST: Chaiyaphum, Nong Bua Dong, 300-400 m, 15°10'N-101°30'E, 15 Aug 1972, Larsen et al. 31892 (E).

44. Clitoria javanica Miq., Fl. Ind. Bat. 1: 226. 1855.

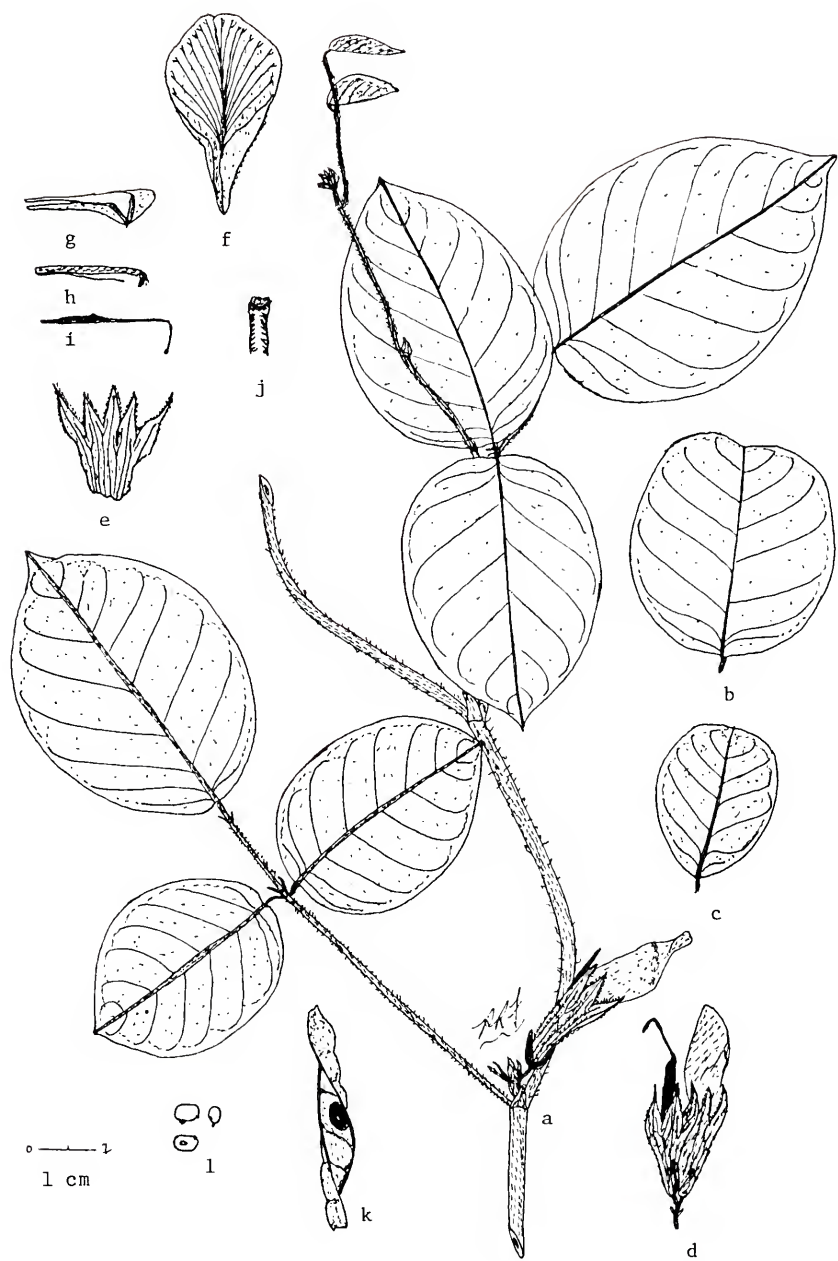
Suffrutescent herb, trailing to climbing, subtwining, to 1.5 m long. Stems subterete, lignose below, longitudinally striated, 1-3 mm diameter, pith hollow; internodes 3-13 cm, pubescence of uncinete trichomes beneath appressed to suberect trichomes. Leaves 3-foliate, leaflets broadly ovate to nearly orbicular, to slightly longer than broad, apex variable, obtuse and abruptly short-acuminate, acumen broad, to 4 mm wide, mucronate, or apex becoming truncate to retuse, base broadly rotund, midrib above weakly raised within a groove alongside the midrib, primary nerves of 7-9 pairs, upper surface green, glabrous or bearing some uncinete trichomes along the midrib, lower surface pale green, sericeous and soon becoming strigose, lamina 3-5 (7) cm long, 2-5 cm wide. Petioles angular, 3-5.5 cm, pubescence moderately dense, uncinete and strigose; rachis short, 1-2 cm. Petiolules 3-4 mm, dark-shaded, with whitish-yellow, sericeous pubescence. Stipules ovate, acute, 5-7 mm long, 3-4 mm wide, conspicuously nerved, 9-11 nerves prominently raised, pubescence strigose, uncinete, ciliate; stipels linear, 3-6 mm long, to 1 mm wide, pubescence primarily uncinete. Inflorescence axillary racemes, 1 (2) per node, each 1-2-flowered, axis 0.5-1.5 cm long, pubescence uncinete and strigose; peduncles 5-12 mm. Pedicels 2-4 mm. Bracts small, uncinete, strigose, and ciliate pubescent; inner bracts oblong-lanceolate, acuminate 1-2 mm, 4-5 mm long, 1-1.5 mm wide; middle pair of bracts lanceolate, short-acuminate, concave around pedicel, 4-5 mm long, 1.5-2 mm wide; outer bracts ovate, 2-3 mm long, 1-1.5 mm wide. Bracteoles oblong-lanceolate, subulate-acuminate ca 1 mm, 5-8 mm long, 1.5-2 mm wide, inserted to 1 mm below calyx,

pubescence uncinata, strigose, ciliate. CHASMOGAMOUS FLOWERS white, small, ca 3.5 cm long. Calyx pubescence conspicuously (20 X), densely uncinata-pubescent beneath subappressed to suberect, 1-1.5 mm, white trichomes conspicuous to the naked eye, calyx tube 8-9 mm long, 2-3 mm wide at base expanding to 5-6 mm wide at the throat, 10-nerved, lobes ovate-lanceolate, acuminate in upper half, subequal to the tube length, 8-9 mm long, 2 mm wide, ciliate, ventral lobe 8-10 mm. Vexillum with pubescence moderately strigose, primarily along nerves, blade ca 1.5-2 cm wide, claw ca 7-8 mm. Alae extended beyond carina 4-5 mm, blade 12-15 mm long, 3-4 mm wide, claw 10-12 mm. Carina ca 6 mm long, 3 mm wide, claw ca 13-15 mm. Gynophore 2-3 mm, densely uncinata-pubescent; ovary 6-7 mm long, 0.8 mm wide, densely uncinata-pubescent; style 13-14 mm long, geniculate 4-5 mm from the distal end. Staminal tube 17-21 mm, free filaments 2-3 mm; anthers 1 mm long, 0.5 mm wide. Legume short-stipitate, weakly depressed between the seeds, ecostate, ca 4 cm long, 7 mm wide; stipe 8 mm, enclosed within calyx tube along with base of legume; dehiscence causing valve to twist one-half of a turn. Seeds brownish-black, viscid, slightly wider than long, 3 mm long, 4-5 mm wide, 2.5 mm thick, ca 6 seeds per pod. CLEISTOGAMOUS FLOWERS absent. Figure 96.

Horsfield's Clitoria is characterized as a vine with 3-foliate leaves whose leaflets are small, nearly as broad as long, and bearing small flowers with the calyx lobes subequal to the tube length, and ecostate legumes which are weakly depressed between the seeds.

PHENOLOGY: The few collections of this species indicate that flowering occurs in August and fruits in October.

Figure 96. Clitoria javanica. (a) portion of stem, x 1; (b-c) leaflets, x 1; (d) inflorescence, x 1; (e) calyx, x 1; (f) vexillum, x 1; (g) ala and carina, x 1; (h) androecium, x 1; (i) gynoecium, x 1; (j) stigma and style apex, x 9; (k) legume, x 1; (l) three views of seed, x 1. (Kerr 13388, K-124: a,e-j. Kerr 19770, BM: b-d; K-125: k-l.)





TYPE COLLECTION: JAVA. Papitjan, door Dr. T. Horsfield s.n.  
(LECTOTYPE: BM. Isolectotypes: K-133; U 37656A-a fragment).

Miquel cited only one collection but failed to designate the institution of deposit. Of the known specimens, the British Museum specimen is chosen as the lectotype because its data most closely match the published data, and this specimen also bears flowers (which were described). The British Museum specimen has "Java, Papitjan, T. Horsfield" on the back of the herbarium sheet, and the number 255 on the front. The script label at Kew bears the same data plus "dial. dut pr Sili," which is difficult to decipher and may be misinterpreted. It bears the numbers 283 and 122. The Utrecht specimen is labeled "Typus fragnose" and lacks further data, and has two leaflets attached to a petiole and rachis (one leaflet lateral, the other terminal). The leaflets are similar in aspect and the specimen probably represents a cotype. The British Museum specimen has one detached leaf (leaflet ?) mounted to the herbarium sheet that does not belong to this species (and is non Clitoria), being highly asymmetrical, having a different pubescence, and bearing a different nerve pattern.

The type collection collected by Horsfield outside the door to his home may have been from a cultivar. A number of Java collections have been examined, of which none belong to this species. However, the other examined collections of this species were collected in Thailand.

NOTES: Clitoria javanica has sometimes been synonymized with C. macrophylla from which it is distinct and is recognized easily by its small leaflets nearly as broad as long, calyx lobes subequalling the calyx tube, and smaller flowers with a shorter calyx tube and smaller bracteoles.

Clitoria javanica was recently placed in synonymy under C. rubiginosa (= C. falcata) by Backer and Brink (1963). Clitoria falcata has been introduced into Java and is distinguished by its medium-sized flowers, longer calyx with the lobes conspicuously shorter than the tube length, the elongated peduncles, and costate fruits. Younger portions of the stems of C. falcata are conspicuously, densely pubescent with long, rufus trichomes.

Clitoria javanica has its closest affinities with C. cordiformis which is distinguished by its 1-foliate, heart-shape leaves of much larger size.

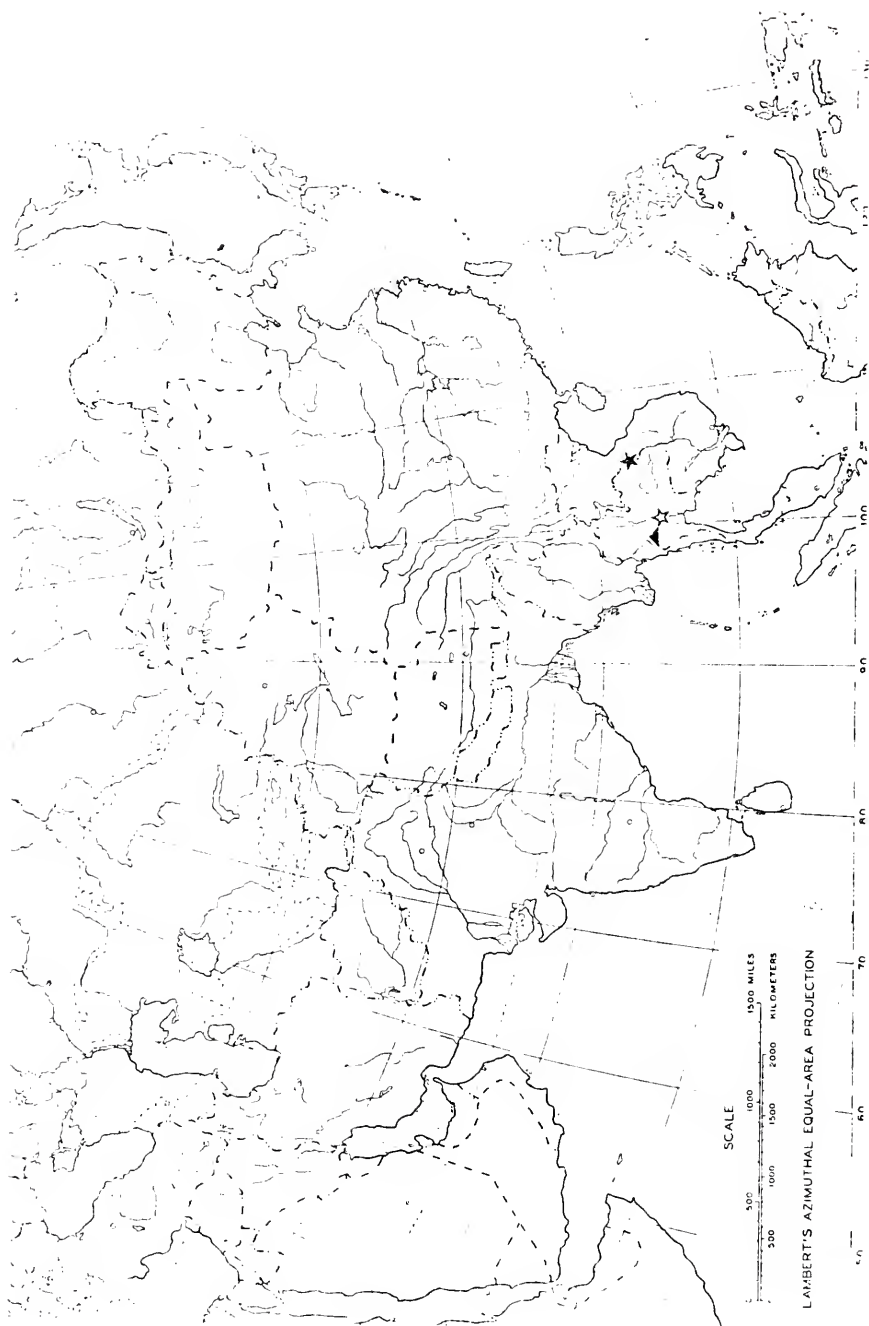
DISTRIBUTION (Figure 97): Clitoria javanica rarely has been collected, and is an apparent endemic of central Thailand (?), although the type came from Java where it has not since been collected.

T H A I L A N D (SIAM). Sarat, Kanchan. . . , 2 Aug 1927, Kerr 13388 (K). CENTRAL: Kao Tawn, Kanburi, 100 m, 19 Oct 1930, Kerr 19770 (BM,K).

45. Clitoria cordiformis Fantz, sp. nov.

Suffrutescent herb, scandent. Stems terete, angular, longitudinally striated, 1-2 mm thick, pith hollow, pubescence dense on juvenile portions, uncinate and strigose, becoming sparsely pubescent, internodes 2-5 cm, weakly twining. Leaves 1-foliate, thick-membranaceous, long-petiolate, leaflet terminal, broadly ovate to nearly orbicular, cordiform, apex rotund and abruptly short-acuminate, mucronate 1-2 mm, base broad, cordate, margin weakly revolute, midrib weakly impressed above, primary nerves of 10-12 pair, nerves nearly parallel with arcuate

Figure 97. Asian distribution of three species of section Tanystyloba.  
Clitoria cordiformis (☆); C. javanica (▲); C. linearis  
(★).



apex, upper surface green, glabrous, lower surface slightly pale green, pubescence sparse, trichomes uncinata and strigose, densest along nerves, lamina 7.5-10 cm long, 7-10 cm wide. Petioles angular, weakly subquadrate, longitudinally nerved and caniculate, 4.5-6 cm, pubescence uncinata and sparsely strigose, basal portion of petiole 4-5 mm, rugose; rachis absent. Petiolule subquadrate, rugose, 4-6 mm, conspicuously pubescent. Stipules persistent, oblong-lanceolate, acute, striated on both surfaces, 5-8 (10) mm long, 1.5-2 mm wide, pubescence uncinata and sparsely strigose, ciliate; stipels similar, linear, 6.5-8 mm long, 0.6-0.8 mm wide. Inflorescence solitary, axillary, racemose, conspicuously shorter than the petiole, 0.4-0.6 cm long, 2-flowered; peduncles uncinata and sparsely strigose-pubescent. Pedicels 4-5 mm. Bracts uncinata-pubescent and occasionally sparsely strigose near apex; inner pair caducous between pedicels; middle pair persistent, lanceolate, broadly acuminate, slightly concave enclosing pedicel, 4-4.5 mm long, 1.5 mm wide; first outer pair semipersistent, between pedicels, lanceolate, acute, 3.5 mm long, 1 mm wide; second outer pair caducous, opposite pedicels, 1.5 mm long, 0.5 mm wide. CHASMOGAMOUS FLOWERS white, ca 3.5 cm. Bracteoles persistent, oblong-lanceolate, acuminate, 7-8 mm long, 1.5 mm wide, inserted to 0.5 mm below calyx, pubescence uncinata and more or less pilose near apex. Calyx pubescence dense, conspicuously (20 X) uncinata, 10-nerved, a nerve extending into each lobe, and a nerve extending to each sinus, then sending two branches into each adjacent lobe, tube 9-10 mm long, 2-2.5 mm wide at the base expanding to 4.5-5.5 mm wide at the throat, lobes broadly lanceolate, long-acuminate, 7-nerved near base, 5-nerved towards apex, lobes 9-10 mm long, subequalling the length of the tube, ca 2.5 mm wide near base. Vexillum

with pubescence of uncinata and scattered, isolated, appressed trichomes, blade ca 2 cm wide, clawed. Alae extended 6 mm beyond carina, blade oblong-spatulate, broadening beyond carina, 14 mm long, 3-5 mm wide, claw 10 mm. Carina falcate, blade 10 mm long, 3.5 mm wide, claw 12 mm. Staminal tube 17 mm, incurved near apex, free filaments 1.5-3 mm; anthers 1 mm long, 0.8 mm wide. Gynophore 2.5 mm, pubescence densely uncinata; ovary 6 mm long, 0.9 mm wide, pubescence densely uncinata; style 12 mm long, geniculate 4 mm from distal end, pubescence uncinata and hispid-bearded; stigma dilated, compressed, 1 mm in diameter, pubescent at base. Legume unknown. CLEISTOGAMOUS FLOWERS absent. Figure 98.

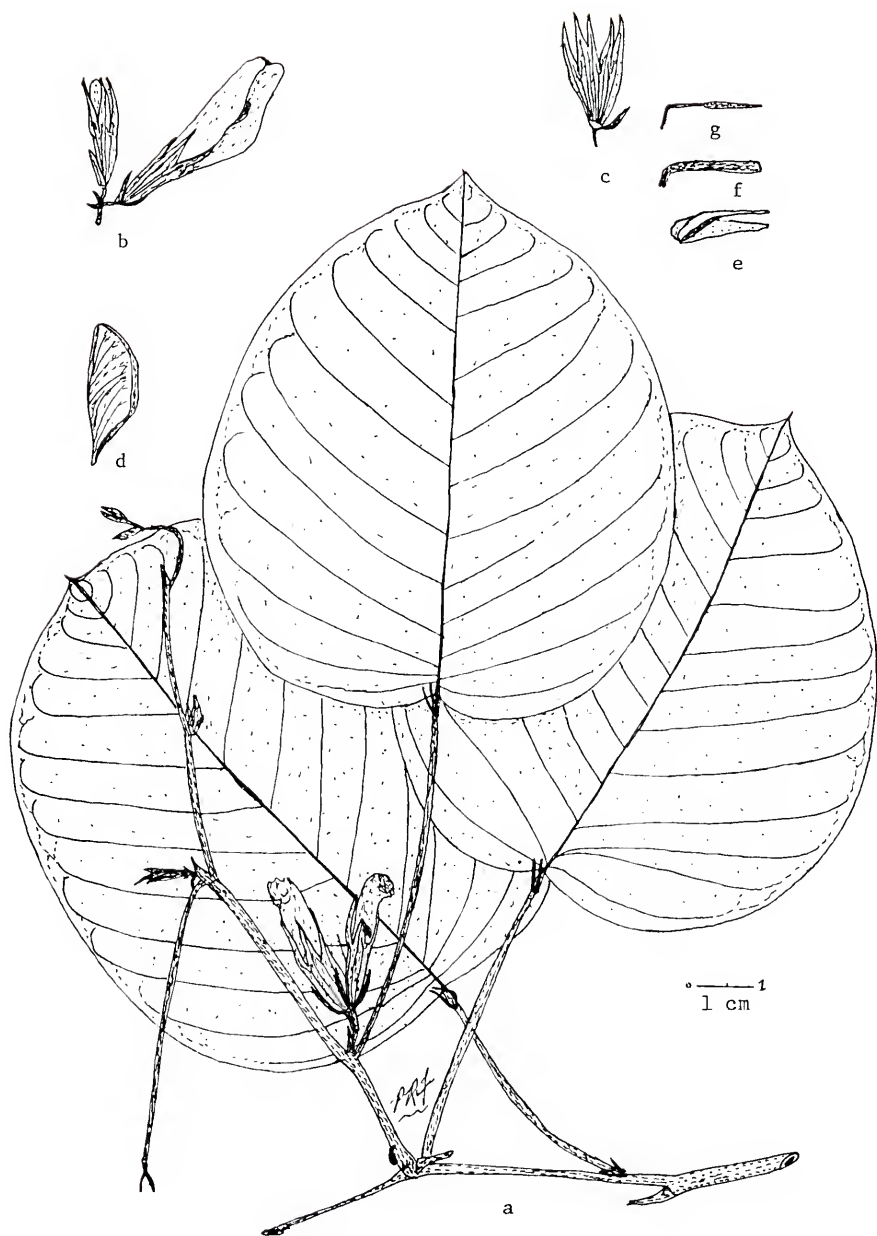
Cordiform Clitoria is characterized by its long-petiolate, unifoliate, cordiform leaves, contracted inflorescences bearing white flowers, and calyx lobes that are subequal to the tube.

PHENOLOGY: The only collection of this species was made in late August with flowers.

TYPE COLLECTION: THAILAND. Central: Nakhorn Sawan, Nawng Takhli, 100 m, 22 Aug 1963, Smitinand & Sleumer 1088 (HOLOTYPE: K-126).

NOTES: Clitoria cordiformis has close affinities with C. javanica which is distinguished by its 3-foliate leaves of which the leaflets are nearly half the size of those of C. cordiformis. Clitoria cordiformis also has affinities with C. macrophylla, another species which bears stalked, unifoliate leaves. Clitoria macrophylla can be distinguished by the presence of 3-foliate leaves, larger flowers and bracteoles, longer calyx tubes and bracts, and the calyx lobes being somewhat longer than the tube length.

Figure 98. Clitoria cordiformis. (a) portion of stem and juvenile branch, x 1; (b) inflorescence, x 1; (c) calyx, x 1; (d) vexillum, x 1; (e) ala and carina, x 1; (f) androecium, x 1; (g) gynoecium, x 1. (Smitinand & Sleumer 1088, K-126: a-g.)





DISTRIBUTION (Figure 97): This species is an apparent endemic of central Thailand, known only from its type collection made in the forest on a limestone slope, where it was scandent in the undershrub layer.

46. Clitoria linearis Gagnepain, in Lecomte Nat. Syst. 3: 108.  
1915.

Suffrutescent herb, erect, 25-40 cm tall. Stems terete, trichomes yellowish, pilose in juvenile portions of stem, becoming glabrous. Leaves 3-foliate, leaflets linear, apex gradually attenuate, mucronate, base broadly cuneate to rotund, primary nerves of ca 18 pair, upper surface green, glabrous, lower surface pale, tomentose pubescent, lamina 6-11 cm long, 0.8-2 cm wide. Petioles short, 1-3 cm, pubescence dense, trichomes yellowish; rachis ca 1 cm. Petiolules 3 mm, tomentose. Stipules linear, acuminate, striated, persistent, 8 mm long; stipels subulate, acuminate, 3 mm long. Inflorescence axillary, subsessile, solitary, 1-2-flowered; peduncle 6-8 mm, base "scaley-bracteate"; pedicels 1-2 mm. Bracts unknown. CHASMOGAMOUS FLOWERS white, small, 2.5-3 cm. Bracteoles linear, acuminate, striate, 7 mm long. Calyx chartaceous, pilose pubescent, nerves prominently raised, tube 8 mm long, lobes deltoid, long-acuminate, 12 mm long, conspicuously longer than the tube length. Vexillum with strigose pubescence, blade oboval, 1.2 cm wide, gradually narrowed to a claw. Alae blade lanceolate, 8 mm long, narrow, claw decurrent. Carina blade falcate, acute, 8 mm long, 3.5 mm wide, claw 10 mm. Stamens diadelphous, vexillary stamen more or less united; anthers ovate. Ovary pulverulent-pilose; style 2-3 times longer than ovary, ciliate. Legume unknown. CLEISTOGAMOUS FLOWERS unknown. Figure 99.

Figure 99. Clitoria linearis. (a) leaf with axillary inflorescence, x 1; (b) calyx and pair of bracteoles, x 1; (c) vexillum, x 1; (d) ala, x 1; (e) carina petal, x 1; (f) gynoeceium, x 2. (Based upon the illustration published by Gagnepain in Lecomte's Fl. Indo-chine 2: 314, Fig. 33, no. 1-6 only, 1916.)



Gagnepain's Clitoria is characterized as a suffrutescent herb with 3-foliate leaves bearing linear leaflets, tomentose below, contracted inflorescences with very small, white flowers, and a calyx with the lobes much longer than the tube.

PHENOLOGY: The phenology is unknown for this species, but based upon its closes affinities, the reproductive season is possibly near July to October.

TYPE COLLECTION: LAOS. Rive gauche du Mékong, forêts arides vers le 17 degré de latitude, Harmand (Type collection not examined).

NOTES: No specimen has been examined that agreed with the description of this species, nor has the type been examined. Gagnepain (1916) published an illustration of this species (as Fig. 33, no. 1-6, p. 314) depicting the following: (1) a node with one leaf and inflorescence; (2) a calyx and bracteoles; (3-5) vexillum, ala, and carina; (6) gynoeceum. These structures are redrawn in Figure 99 from his illustration.

Vegetatively, the leaves appear similar to some members of C. macrophylla var. sericea, which has elongated leaves, some narrow, and also densely pubescent on the lower surface. Clitoria macrophylla is apparently distinct from C. linearis, and distinguished by larger flowers, longer bracteoles, a longer calyx tube, usually 2- to 4-flowered inflorescences, long-petiolate leaves with a longer rachis, and broader leaflets. Clitoria australis is the only other species of close affinities that has the very small flower (2.5-3 cm). It can be distinguished by the 4- to 6-flowered inflorescence, 1- and 3-foliate leaves, petiole shorter than the rachis, and broader leaflets.

Although no specimens have been examined, the description and illustration clearly indicate that it is a species of the genus Clitoria. The distribution and diagnostic characteristics, especially the calyx lobes being conspicuously longer than the tube length, indicate that this species belongs to section Tanystyloba of the subgenus Neurocarpum. The description presented here was based upon Gagnepain (1915 and 1916). His "pulverulent-pilose ovary" probably indicates a dense pubescence of uncinata trichomes with conspicuous, spreading, macrotrichomes. The yellowish trichomes on the stem and petiole are unique with this species, as its relatives have white trichomes, although the axes are somewhat straw to yellowish in color.

DISTRIBUTION (Figure 97): This species is known only from the type location in Laos.

47. Clitoria hanceana Hemsl., Journ. Linn. Soc. 23: 187. 1887.

Clitoria macrophylla Hance, Journ. Bot. p. 9. 1878; non

Wallich (1831-32) nec Wallich ex Benth. (1852).

Clitoria laureola Gagnep., nom. in sched.

Subshrub to shrub, erect, 0.5-1 m tall. Stems subligonose, longitudinally striated, subterete, 2-4 mm thick, rarely branched, pith hollow, pubescence moderate to dense, trichomes subappressed to suberect, internodes conspicuous to strongly flexuous, short, 2-4 (6) cm long; branches short, 1-2 (3) cm, bearing a diminutive set of leaves at its apex. Xylopodium usually not collected, subterranean, lignose, upper portion horizontal to oblique, bearing aerial stems at apex, swollen, 4-10 mm thick, somewhat cylindrical, to 15 cm to ? cm long, distal

portion slender, 1-3 mm thick, to 10 cm to ? cm long. Leaves thick-chartaceous to subcoriaceous, commonly 3-foliate, subsessile to short-petiolate, infrequently 1-foliate, borne at lower nodes, sessile or rarely petiolate, leaflets variable, basically oblong, elliptic-oblong, lanceolate-oblong, to obovate-oblong, apex obtuse to abruptly short-acuminate, mucronate, base cuneate to broadly cuneate, midrib weakly impressed above, primary nerves of 11-13 pair, spaced ca 3-7 mm apart, often with a conspicuously prominent nerve between some primary pairs, extending ca 30-60 percent of the distance to the margin, upper surface green, glabrous, or bearing scattered uncinat trichomes (most easily seen near midrib when present), lower surface appearing silvery-grayish, sericeous pubescence; trifoliate leaflets 5-10 (14) cm long, 2-4 (8) cm wide; unifoliate leaflets larger, 7-11 cm long, 3-5 cm wide. Petioles subsessile to short, usually conspicuously shorter than the rachis, rarely subequal to longer than rachis, 0.3-2 (rarely 3) cm; rachis 1-2.5 (rarely 4) cm. Petiolules 3-4 mm, densely pubescent. Stipules ovate-oblong, to oblong, short-acuminate, strigose, 4-8 (11) mm long, (2) 3-4 mm wide; stipels subulate to linear, 3-7 mm. Inflorescence axillary, solitary to few-fascicled, contracted, infrequently several, globular; peduncles 2-10 mm, occasionally to 15 mm, 2- (4-) flowered, pubescence uncinat and strigose. Pedicels 3-6 mm. Bracts ovate, strigose; inner pair caducous, 3 mm long, 1 mm wide; middle pair persistent, 4-5 mm long, 1-1.5 mm wide; outer pair deciduous, 2 mm long, 1 mm wide. CHASMOGAMOUS FLOWERS white, small, 3-3.5 cm. Bracteoles oblong, apiculate, 4-8 mm long, 2-2.5 mm wide, inserted to 1 mm below calyx, pubescence uncinat, subpilose, ciliate. Calyx dark-shaded in dry state, pubescence densely uncinat beneath the

conspicuous, white, 1 mm long, subappressed to spreading trichomes, tube 10-nerved, 6-10 mm long, 2-3 mm wide at base to 4-5 mm wide at the throat, lobes ovate-lanceolate, long-acuminate, 3-nerved, middle nerve often dark-shaded and more prominently raised, lobes 8-12 mm long, conspicuously longer than the tube length, 2-3 mm wide, ventral lobe 9-13 mm. Vexillum with pubescence dense to moderate, strigose, with uncinete trichomes beneath and more conspicuous on claw, blade 1.5-2 cm wide, claw 5 mm. Alae extended beyond carina 4-5 mm, blade ca 7-8 mm long, 4-5 mm wide, decurrent on 10-12 mm claw. Carina subfalcate, 6-7 mm long, 3.5-4 mm wide, claw 10-12 mm, uncinete-pubescent. Staminal tube 14-18 mm, free filaments 2-3 mm; anthers elliptic, 1-1.2 mm long, 0.7-0.8 mm wide. Gynophore 1-2 mm, densely uncinete-pubescent; ovary 7-8 mm long, 1 mm wide, densely uncinete-pubescent with a few long (1-1.5 mm) trichomes vexillarily near base; style 11-14 mm, geniculate 4 mm from the distal end; stigma compressed, ca 0.8 mm. Legume short-stipitate, ecostate, weakly depressed between the seeds, glabrate with inconspicuous uncinete trichomes more readily seen and somewhat denser toward base and sutures, 3.3-6 cm long, 7-9 mm wide; stipe enclosed within calyx along with base of legume, 6-11 mm long, apex expanding to 4 mm wide; beak 3-4 mm; dehiscence causing valves to twist one-fourth to one-half of a turn. Seeds black, viscid, slightly wider than long, 4 mm long, 4.5-5 mm wide, 3 mm thick, 2-6 seeds per pod. CLEISTOGAMOUS FLOWERS absent. Figures 100 and 102.

Hance's Clitoria is characterized by its shrubby habit, subsessile to short-petiolate leaves of 1- and 3-leaflets, small white flowers borne on contracted, fascicled inflorescences, calyx lobes longer than

Figure 100. Clitoria hanceana - I. Var. hanceana: (a) portion of stem, x 1; (b) petiole and rachis with stipels, x 1; (c) calyx, x 1; (d) vexillum, x 1; (e) ala and carina, x 1; (f) androecium, x 1; (g) gynoecium, x 1; (h) legume, x 1. (Sampson 11364, K-1, Hb. Hance: a-h.)





the tube length, lengumes weakly depressed between the seeds, and the often strongly flexuous stem internodes.

PHENOLOGY: Flowers are collected between March and July, with fruits collected in July, and October to November.

TYPE COLLECTION: CHINA. Kwangtung: In incultis secus amnem "North River," circ. 200 millipass, a Cantone, 23 Jul 1864, Sampson 11364 (LECTOTYPE: K-1, hb. Hance. Isotype: BM).

This species was reported originally by Hance (1878) as C. macrophylla Wall., a misidentification of the specimen in Hance's herbarium. Hemsley (1887) described this new species, honoring Hance, and citing the specimen in Hance's herbarium, but did not designate the location of this specimen. Of the two specimens examined from the type collection, both have rather comparable material, but the Kew specimen contained a dissected flower in its packet. Since Hemsley described the flower structures, the Kew specimen is selected as the lectotype because it more closely matches the original description.

NOTES: Clitoria hanceana has been confused with C. macrophylla which is distinguished by its climbing habit, larger flowers, longer bracteoles and calyx tube, and petiolate leaves with the petiole longer than the rachis. Clitoria hanceana appears to have closer affinities with C. australis which has slightly smaller flowers, shorter staminal tubes, ovaries, and calyx tubes, and a much denser pubescence of the macrotrichomes of the calyx.

The C. hanceana complex is in need of further study. The number of collections available for this study were quite limited, yet there appear to be five distinct varieties, each geographically separated as well as morphologically distinct. As with some other species of

Clitoria, C. hanceana has a variety in which the inflorescences are fascicled, highly contracted, with numerous bracts appearing as scales on the axes, and many flowers in glomerules. This variety has been named previously by Gagnepain as var. laureola. Other varieties have loosely-flowered inflorescences, with measurable differences in the petiole and rachis lengths, and the width of the leaflets.

DISTRIBUTION (Figure 101): The members of C. hanceana are widely disjunct in southeast Asia. The species has been collected in southern China, Thailand, Cambodia, and Vietnam.

#### KEY TO VARIETIES:

1. Petiole (especially at middle & upper nodes) conspicuously shorter than the rachis, usually by a minimum of 5 mm shorter; petiole 0.3-1.3 (1.8) cm long.
2. Leaflets of 3-foliate leaves narrow, 2-4 cm wide; rachis 0.8-2.2 cm long.
3. Inflorescence in loose racemes, solitary to fascicled in leaf axils, not in glomerules; peduncles 1-3 per axil, each 5-20 mm long with rachis internodes 2-8 mm long; calyx tube (7) 8-10 mm.
4. Leaves subsessile, petiole 0.3-0.8 cm; rachis 1.2-1.8 cm; stem internodes short, 2-4 cm, strongly flexuous; stipules 5-8 mm (China). . . . 47a. var. hanceana
4. Leaves short petiolate, petiole (0.6) 0.9-1.8 cm; rachis 1.5-2.5 cm; stem internodes 3-9 cm, weakly flexuous; stipules 7-11 mm long (Thailand). 47b. var. thailanensis

3. Inflorescence in crowded, bracteate glomerules; peduncles 3-8 per axil, each 2-4 mm long with rachis internodes of 1-2 mm; calyx tube 5-7 (8) mm (South Vietnam) . . . . .  
 . . . . . 47c. var. laureola
2. Leaflets of 3-foliolate leaves broad, 4-8 cm wide; rachis 2-3.7 cm long (Thailand) . . . . . 47d. var. latifolia
1. Petioles (especially at middle and upper nodes) slightly shorter than rachis (by 1-3 mm) to longer than rachis; petiole 1.5-4 cm long (Cambodia) . . . . . 47e. var. petiolata

47a. Clitoria hanceana Hemsley var. hanceana

Clitoria macrophylla Hance, Journ. Bot. p. 9. 1878; non  
 Wallich (1831-32) nec Wallich ex Benth. (1852).

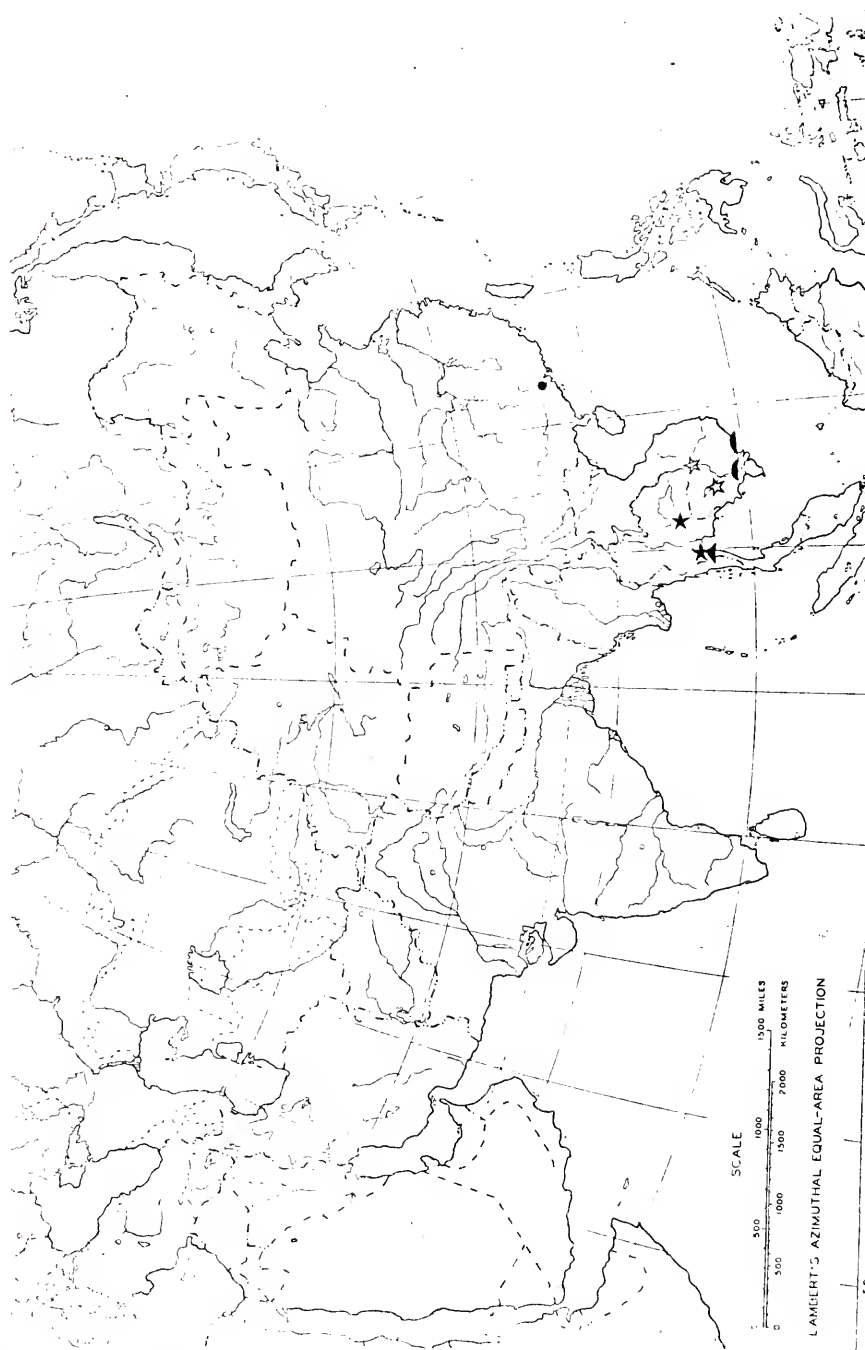
Stem internodes short, 2-4 cm, strongly flexuous. Trifoliolate leaves subsessile, leaflets narrow, 5-9 cm long, 2-3.5 cm wide, lower surface sericeous. Petiole shorter than rachis, 0.3-1 cm long; rachis 1-2 cm long. Stipules 5-8 mm long. Inflorescences of lax racemes, 1-3 per axil; peduncles 5-15 mm long. Calyx tube 8-10 mm long.

The typical variety is recognized easily by its subsessile leaves borne on strongly flexuous stems, the leaflets being narrow and densely pubescent below.

DISTRIBUTION (Figure 101): This variety is known only from the type collection in Kwangtung, China, and one collection with poor data.

C H I N A. China, S.N.N., Anonymous s.n. (GH).

Figure 101. Asian distribution of Clitoria hanceana, section Tanystyloba. Var. hanceana (●); var. latifolia (▲); var. laureola (◐); var. petiolata (☆); var. thialanensis (★).



47b. Clitoria hanceana Hemsley var. thailanensis Fantz, var. nov.

Stem internodes elongated, 3-9 cm, weakly flexuous. Trifoliate leaves short-petiolate, leaflets narrow, 7-11 cm long, 2-4 cm wide, lower surface sericeous. Petiole shorter than the rachis, 0.5-2 cm long; rachis 1.5-2.5 cm long. Stipules 7-11 mm long. Inflorescences loose racemes, 1-2 per axil; peduncles 0.5-1.5 cm. Calyx tube 7-9 mm long.

The most common variety of Thailand is recognized easily by its short-petiolate leaves, the leaflets being narrow and densely pubescent below, and by the elongate stipules.

TYPE COLLECTION: THAILAND. Northeast: Ban Chum Seng, Korat, 21 Mar 1930, Put 3074 (HOLOTYPE: K-103. Isotype: BM).

The letter "d" was deliberately dropped in forming the varietal epithet to improve pronunciation.

DISTRIBUTION (Figure 101): This variety is known from the northeast and central provinces of Thailand.

T H A I L A N D (SIAM). NORTHEAST: Ban Chum Seng, Korat, 24 May 1929, Noe 231 (BM,K). CENTRAL: Ratburi, 16 Jul 1924, Marcon 1752 (K).

47c. Clitoria hanceana Hemsley var. laureola Gagn., in Lecomte

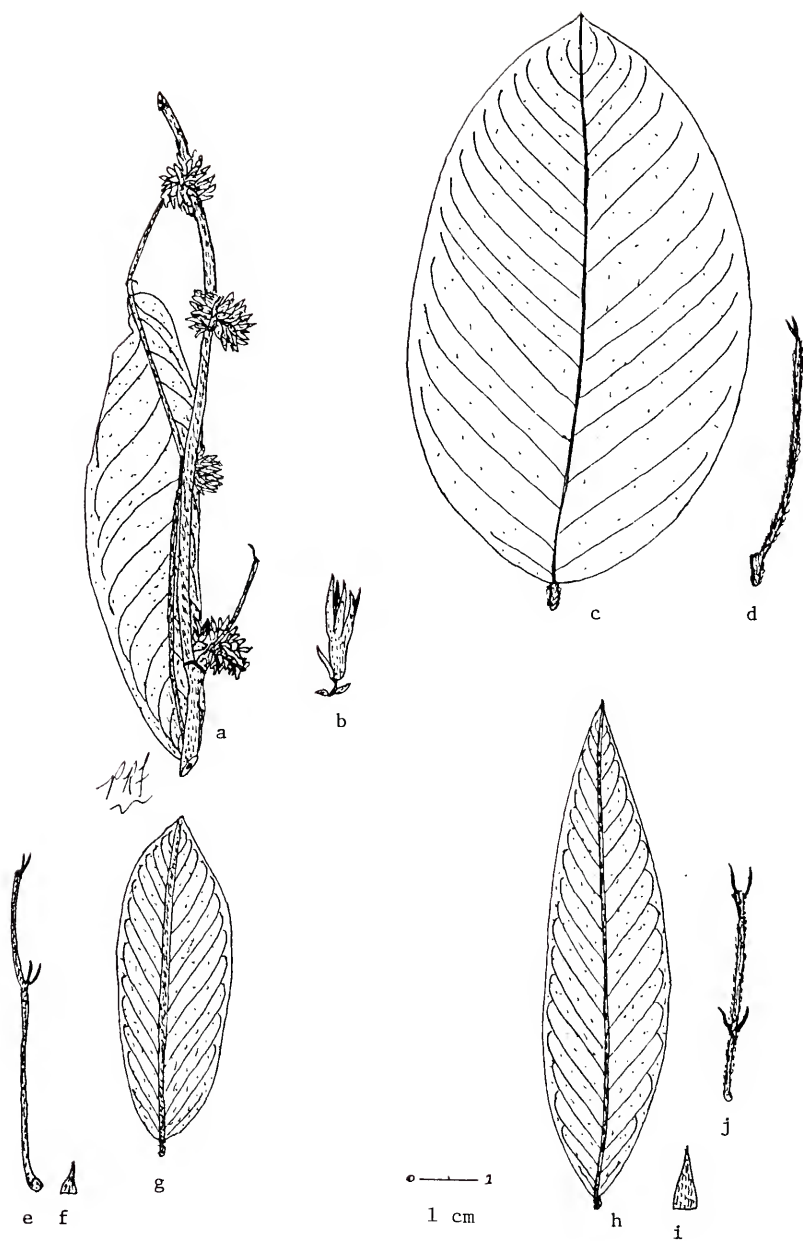
Fl. Indo-chine 2: 313. 1916; p.p. maj. emend. Fantz

Clitoria laureola, nom. in sched.

Stem internodes 1.5-4 cm, flexuous. Trifoliate leaves subsessile, leaflets narrow, 4-9 cm long, 1.5-3 (3.5) cm wide, lower surface sericeous. Petiole shorter than rachis, 0.3-1.3 cm long; rachis 1-1.8 (2.3) cm. Stipules 4-7 mm. Inflorescences fascicled in axillary

Figure 102. Clitoria hanceana - II. Var. laureola: (a) portion of stem with glomeruled inflorescences, x 1; (b) calyx, x 1. Var. latifolia: (c) leaflet, x 1; (d) petiole and rachis, x 1. Var. petiolata: (e) petiole and rachis, x 1; (f) stipule, x 1; (g) leaflet x 1. Var. thialanensis: (h) leaflet, x 1; (i) stipule, x 1; (j) petiole and rachis, x 1. (Pierre s.n., Nov. 1867, E-91: a-b. Pierre 72, K-107: c-d. Thorel s.n., F 540762: e-g. Put 3074, K-103: h-j.)





glomerules, up to 1 cm diameter, highly bracteated; flowers crowded, numerous; peduncles 3-8 per axil, 2-4 mm long with rachis internodes of 1-2 mm; inflorescence axis 5-7 mm long. Calyx tube short, 5-7 (8) mm long.

This variety is recognized easily by the fascicled inflorescences in glomerules and shorter calyx tube. All collections examined were collected in October or November, and lacked flowers. They bore fruits or were collected after fruits had dropped.

TYPE COLLECTION. SOUTH VIETNAM. Cochinchina: ad Chóben prope Baria, Oct 1866, Pierre s.n. (LECTOTYPE: K-9. Isolectotype: F 540296).

Gagnepain did not designate a type collection. He published four syntype collections. Of these, only the Pierre & Thorel collections bore the name C. laureola, a nomina in schedula which was the source of the varietal epithet, and thus are the more probable type collections.

Gagnepain distinguished var. laureola from the typical variety by the glomerulate inflorescences, longer and more lanceolate bracteoles, the somewhat longer petioles, and the somewhat narrower, lanceolate leaflets. Gagnepain's diagnostic characters either break down or do not agree with the specimen. The primary diagnostic characteristic is the glomerulate arrangement of the inflorescences, which is very conspicuous in the Pierre collections. The Godefroy collection cited by Gagnepain under both var. laureola and var. hanceana agrees with the cited Thorel collections. Both of these collections have an elongated petiole becoming longer than the rachis, a characteristic distinct from all other members of C. hanceana, and both collections have non-glomerulate inflorescences. Both the bracteole length and the leaflet width are variable, and unreliable as diagnostic characteristics between var.

laureola and var. hanceana. The range of variation is nearly the same in both varieties.

Of the four cited syntype collections, Massie (Laos) was not examined. Since the distinct inflorescence type was described by Gagnepain, and the only characteristic that is not variable, it was presumed that this characteristic was the primary one upon which Gagnepain based his variety. Gagnepain described this trait first, and the only collection cited which agrees with this characteristic is Pierre. Thus, the variety as described by Gagnepain is emended to include the Pierre collections; and to exclude the Thorel and Godefroy collections which lack this inflorescence type, but are distinct in having petioles longer than the rachis, and thus placed in a separate variety.

Of the two Pierre collections, the one from Chóben is a syntype collection, and as the only collection with the distinctive inflorescence, is selected as the lectotypic collection. The Kew specimen is the more probable one examined by Gagnepain, and had better material, thus it is designated as the lectotype.

DISTRIBUTION (Figure 101): This variety is known from the Cochinchina area of South Vietnam.

S O U T H V I E T N A M. COCHINCHINA: Ad Montem Bay in prefectura Chaudoc, Nov 1867, Pierre s.n. (BM,E,F).

47d. Clitoria hanceana Hemsley var. latifolia Fantz, var. nov.

Stem internodes elongate, 4-9 cm, weakly flexuous. Trifoliate leaves subsessile, leaflets broad, 6-14 cm long, 4-8 cm wide, lower

surface moderately sericeous. Petiole shorter than rachis, 0.3-0.9 cm long; rachis (2) 2.5-3.7 cm long. Stipules 6-8 mm. Inflorescence of lax racemes, 1-3 per axil. Calyx tube 8-9 mm.

This variety is recognized easily by its broad leaflets.

TYPE COLLECTION: THAILAND. Central: prov. Petchaburi rigni siami, Jun 1868, Pierre 72 (HOLOTYPE: E-90. Isotype: K-107).

The Edinburgh specimen has flowers and younger leaves, yet leaflets are commonly 4-6 cm wide. The Kew specimen lacks flowers, and has older leaves, 5.5-8 cm wide. This variety is known only from the type collection.

47e. Clitoria hanceana Hemsley var. petiolata Fantz, var. nov.

Clitoria hanceana Hemsley var. laureola Gagn. in Lecomte Fl.

Indo-chine 2: 313. 1916; p.p. min.

Stem internodes elongated, 3-10 cm, weak to strongly flexuous. Trifoliate leaves short-petiolate, leaflets narrow, 5-10 cm long, 2-4 cm wide, lower surface with pubescence thinly sericeous to strigose. Petiole slightly shorter than to becoming longer than the rachis, 1.5-4 cm long; rachis 1-2.3 cm. Stipules (5-6) 8-10 mm. Inflorescence of lax racemes, non-glomerulate, 1-2 per axil; peduncles 3-5 mm.

This variety is recognized easily by the petiolate leaves, somewhat longer stipules, and a rachis distinctly shorter than the petiole.

TYPE COLLECTION: CAMBODIA. Strung-streng, Me Kong Exp., 1866-68, Thorel s.n. (HOLOTYPE: BM. Isotypes: E-42, F 540762).

DISTRIBUTION: This variety is known only from Cambodia.

C A M B O D I A. Cau-coy, 14 Jul 1862-66, Thorel s.n. (K). PURSAT: Mont. de Pursat, 400 m, Jun, Godefroy 348 (K).

48. Clitoria australis Benth., in Benth. & Mueller Fl. Austral.

2: 242. 1864.

Clitoria alba R. Brown, nom. in sched.; non Don (1832).

Subshrub to suffrutescent herb, erect, 50-70 cm tall, occasionally with apices drooping toward ground and creeping to trailing. Stem pubescence appressed, dense, somewhat silky, pith hollow; erect portions of stem lignose, usually unbranched, 3-6 mm thick, internodes flexuous, 3-6 cm long; upper portions of stem weakly twining, sublignose to herbaceous, sparsely branched, 2-4 mm thick, internodes elongated, 7-15 cm. Xylopodium not observed. Leaves 3- and 1-foliolate, thick-chartaceous, subsessile to short-petiolate, leaflets ovate, oval, to elliptic, the ratio of length/width is less than two, apex obtuse, rarely nearly truncate or rarely retuse, occasionally abruptly short-acuminate, acumens 2-5 mm, mucronate, base rotund, midrib weakly raised, primary nerves of 8-10 pair, upper surface dark green, dull, glabrous except for 0.5 mm long, deciduous subappressed trichomes along midrib, lower surface green, sericeous, trichomes becoming thinned with age; trifoliolate leaflets 4.5-7 (9) cm long, 2.5-5 cm wide, terminal leaflet often conspicuously larger than lateral leaflets, ca 1.5 times the size of the lateral leaflets; unifoliolate leaflets similar to terminal leaflet of trifoliolate leaves, 5-7 cm long, 3-5 cm wide, stalk 1-2 cm, similar to a rachis. Petioles of trifoliolate leaves longitudinally striated, subsessile on erect portions of stem and conspicuously shorter than the rachis, 0.3-1.5 (2) cm long, short, and slightly shorter to longer than the rachis on the viney portions of stem, 1.5-3 cm long; pubescence similar to stem; rachis 1-3 cm long. Petiolules 3-4 mm,

sericeous. Inflorescence axillary, racemose, solitary or paired, 0.5-1.5 cm long, (2-) 4- to 6-flowered; peduncles 5-14 mm long, elongating to 12-18 mm in fruit, pubescence of silky, subappressed trichomes; rachis 1-3 mm. Pedicels 3-5 mm. Bracts ovate, acute, sericeous; inner bracts caducous, 1.5-2 mm long, 0.7-1 mm wide; middle bracts (3) 4-5 mm long, 1-2 mm wide; outer bracts 4 mm long, 1 mm wide. CHASMOGAMOUS FLOWERS white, small, 2.5-3 cm. Bracteoles lanceolate, acuminate, sericeous, 6-8 mm long, 2-3 mm wide. Calyx pubescence sparsely uncinata beneath the dense, silky, pilose, 0.7-1.5 mm trichomes, tube 10-nerved, 6-8 mm long, 2-3 mm wide at base expanding to 4-5 mm wide at the throat, lobes ovate near base, long-acuminate, ciliate, conspicuously longer than tube length, 9-11 mm long, 2-3 mm wide at base, ventral lobe subequalling other lobes, 9-11 mm. Vexillum with pubescence appressed, primarily along nerves, blade 1.3-1.5 cm wide, claw ca 4 mm. Alae extended beyond carina 3-4 mm, blade ca 10-11 mm long, 3-4 mm wide, claw 9-10 mm. Carina ca 5 mm long, 2 mm wide, claw 13-14 mm. Staminal tube 13-15 mm long, vexillary stamen coherent in lower half, free at base and above the middle, free filaments 1-2 mm; anthers 1 mm long, 0.5-0.7 mm wide. Gynophore 2-3 mm, uncinata-pubescent; ovary 6-7 mm long, 0.7-1.0 mm wide, densely uncinata-pubescent; style 11-13 mm long, geniculate 4 mm from distal end. Legume short-stipitate, ecostate, depressed between the seeds, uncinata-pubescent becoming glabrate with uncinata trichomes primarily along the sutures and near the base of the legume, valves 3-4.5 cm long, 8-10 mm wide; stipe 5-7 mm, enclosed within calyx tube along with base of legume; beak 4-5 mm; dehiscence of valves not observed. Seeds not observed; 4-6 seeds per pod. CLEISTOGAMOUS FLOWERS absent. Figure 103.

Figure 103. Clitoria australis. (a) portion of stem, x 1; (b) flower, x 1; (c) calyx, x 1; (d) vexillum, x 1; (e) ala and carina, x 1; (f) androecium, x 1; (g) gynoeceum, x 1; (h) flower with juvenile fruit, x 1; (i) flower with nearly mature fruit, x 1. (Brown 4237, E-109: a. Schomburgk 153, K-144: b-i.)





Brown's Clitoria from Australia is characterized as a subshrub with 3- and 1-foliate leaves, very small white flowers, a very short calyx tube with a silky pubescence and with lobes conspicuously longer than the tube, and fruits depressed between the seeds.

PHENOLOGY: Dates of collections are usually absent for this species. Two collections indicate that flowers are produced in September and October with fruits produced in October.

TYPE COLLECTION: AUSTRALIA. Arnhem S. Bay, 1802-05, R. Brown 4237 (LECTOTYPE: K-10. Isolectotypes: E-108 and 109; Lectoparatype: F 39504, NY).

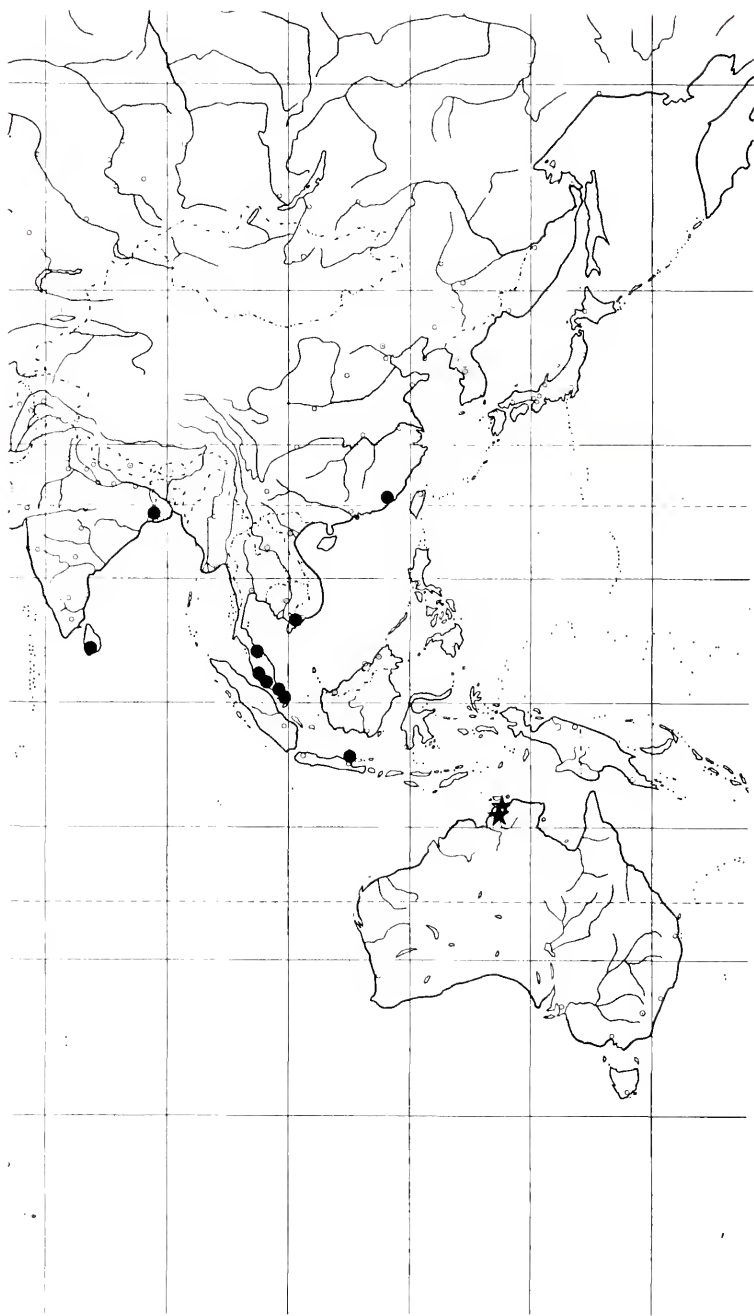
Bentham cited one collection of C. australis as "N. Australia, Arnhem S. Bay, R. Brown (Herb. R. Brown)." Bentham also noted that he was unable to adopt Brown's name, C. alba, because it was already preoccupied in the genus (i.e. C. alba Don. 1832). Five specimens of this species collected by R. Brown were examined. Two specimens (E-108,K) bear the number "4237" and Brown's name of "Clitoria alba R. Br.," but did not have any Australian locality. The data were placed on a label printed under the direction of J. J. Bennett. The specimen (E-109) lacked the number and Brown's name, but bore the data "Arnhem S. Bay." The Field Museum specimen (Hb. Small) and the New York Botanical Garden Herbarium specimen (Hb. Columbia College) each lacked the collection number and the specific Australian locality. In addition, these two specimens appear somewhat distinct from the other three specimens, in the age of the flowers, coloration of vegetative parts, and in overall stature. It seems probable that this pair of specimens were collected on different dates or from separate populations and are not duplicate collections of the specimens deposited at Kew and Edinburgh.

Of these probable type specimens, it is not clear which specimens Bentham examined. Stafleu (1967, p 54) indicated that Brown's Herbarium went to J. J. Bennett in 1858, and was later split upon the latter's death in 1876, with collections going to the British Museum, to Kew, and to Edinburgh. Bentham examined these specimens prior to his publication in 1864, presumably when they were part of Bennett's Herbarium. Bentham obtained his data from the information borne on more than one specimen. In choosing a lectotype, the Field Museum and New York Botanical Garden specimens were excluded from consideration, as they lacked both the specific locality data and Brown's name, and the J. J. Bennett label; thus, it is less likely that they had been examined by Bentham. Of the remaining three specimens, the Kew specimen is a good representative specimen of the species, and is designated as the lectotype. The Field Museum and New York Botanical Garden specimens are probable syntypes, but not duplicates of the type collection in the opinion of this author; therefore, they are noted as lectoparatypes instead of isolectotypes.

NOTES: Clitoria australis has close affinities with C. hanceana which is distinguished by its slightly larger flowers, longer calyx tube and staminal tube, larger ovary, and broader stipules. Clitoria australis is the only native member of the genus found in Australia, and historically, has never been confused with other species. Clitoria ternatea is occasionally cultivated in Australia, or introduced as a forage crop, but can be distinguished easily from C. australis by its 5- and 7-foliate leaves and blue flowers.

DISTRIBUTION (Figure 104): This species is endemic to the northern most area of the Northern Territory of Australia.

Figure 104. Australasian distribution of Clitoria australis (section Tanystyloba) and Clitoria laurifolia (section Neurocarpum).  
C. australis (★); C. laurifolia (●).



A U S T R A L I A. NORTHERN TERRITORY: "Nova Hollandia,"

Anonymous s.n. (PR); Port Darwin, Oct 1869, Schomburgk 153 (K); l.c.,

Palmerston, Sep 1891, Bentham 92 (G); near Darwin, Allen 150 (K);

Prince-Regent River, 1891, Bradshaw & Allen s.n. (K).

Subgenus Neurocarpum

IIIc. Clitoria L. subg. Neurocarpum (Desv.) Baker emend. Fantz  
sect. Neurocarpum.

Neurocarpum Desv., Journ. Bot. 1: 119. 1813.

Martia Leandro Sac., Denkschr. Akad. Muench. 7: 238,

t. 12. 1821; non Martia Sprengl. 1818.

Martusia Schultes, Mant. 1: 69. 1822.

Rhombolobium Rich. ex H.B.K., Nov. Gen. Sp. 6: 406.

1824; pro syn.

Neurocarpon Desv. ex Hamilton, Prod. Pl. Ind. Occ. 50. 1825;

orthogr. err. pro Neurocarpum Desv. (1813).

Rhombifolium Rich. ex DC., Prod. 2: 235. 1825; pro syn.

Neurocarpum Desv. sect. Pilanthum Poir. ex Desv., Ann. Sci.

Nat. Ser. 1: 413. 1826.

Neurocarpus Desv. ex Hasskarl, Cat. Hort. Bogor. Alt. 276,

no 1226. 1844; orthogr. err. pro Neurocarpum Desv.

(1813).

Clitoria L. sect. Neurocarpum (Desv.) Benth., Journ. Linn.

Soc. 2: 38. 1858.

Leaves 3- and 1-foliate, subsessile or petiolate, rarely sessile.

Inflorescence axillary, solitary, racemose, 2- (4- to 6-) flowered; main axis 1-10 (20) cm long. Flowers chasmogamous or cleistogamous.

Chasmogamous flowers showy, blue to purple, occasionally white, typically medium to large, (3.5) 4-7.5 cm. Calyx tube elongate, 11-22 (25) mm, lobes shorter than to occasionally subequalling tube length; pubescence variable. Staminal tube elongate, 2-4 cm. Style typically long,

(1.4) 1.9-3 cm. Cleistogamous flowers minute. Calyx tube 5-11 mm long, lobes 3-7 mm. Staminal tube short, 0.5-1.5 mm. Legume turgid, costate or infrequently ecostate, not depressed between the seeds. Seeds slightly longer than wide.

Members of the section Neurocarpum can be characterized by their fruits which are turgid at maturity, and bear a longitudinal nerve laterally on each valve, seeds which are slightly longer than wide, and the typically medium- to large-sized flowers. Cleistogamous flowers generally have longer calyx tubes and lobes, and shorter staminal tubes.

LECTOTYPIC SPECIES: C. laurifolia Poir. (See note regarding type under type discussion for subgenus Neurocarpum, p. 630-633.)

NOTES: The longitudinally raised nerve is very conspicuous on the valves of the fruits of most members of this section. Mature fruits often are subtetragonus. It has been noted in previous discussions of the fruit that the longitudinal nerve is lacking in some species and incompletely formed to lacking in some of those species which typically bear costate legumes. When present, this characteristic immediately identifies the specimen as belonging to section Neurocarpum.

DISTRIBUTION (Figure 13): Members of section Neurocarpum are commonly found in the neotropics and subtropics. Two species have been introduced into portions of Africa and Indonesia, where they occasionally escape and become naturalized. The majority of species are commonly found in open grasslands and savannas, often adapted to drier areas within this range.

KEY TO SPECIES: Unless noted, floral structures refer to chasmogamous flowers.

1. Style length nearly three times the length of the ovary; ovary pubescence of densely uncinata, microtrichomes, occasionally with macrotrichomes laterally; staminal tube elongate, 23-40 mm; legume costate (strongly to weakly costate, sometimes with imperfectly formed costa to ecostate), uncinata-pubescent with few scattered macrotrichomes; bracteoles 2-5 (8) mm wide; leaves petiolate (petiole 2-6 cm) or sessile or subsessile with petiole (0.2-1.5 cm) subequalling to shorter than rachis (0.3-1.6 cm); erect subshrub to shrub or herbaceous vine, stem 25-200 cm long.
2. Bracteoles elongate, 13-24 mm long; bracts elongate, 8-14 mm long; stipules broad, (3) 5-13 mm wide; stipules elongate, (7) 9-19 mm long; flowers several (commonly 4-8), typically crowded at apex of peduncle, occasionally biflowered; leaflets (of 3-foliate leaves) typically broad, 2.5-6 cm wide.
3. Stipules broad, 7-13 mm wide; leaves petiolate, petiole (2.5-4.5 cm) conspicuously longer than rachis (0.8-2.2 cm); calyx tube short, 12-16 mm; staminal tube short, 25-28 mm; ovary 6 mm; style short, 20-28 mm; ala blade 15-20 mm long, claw 13-16 mm (northeastern Brazil). . . 49. C. stipularis
3. Stipules 3-8 mm wide; leaves subsessile, petiole (0.2-1.4 cm) subequalling to slightly shorter than the rachis (0.2-1.6 cm); calyx tube 16-20 (25) mm; staminal tube elongate, 35-40 mm; ovary 8-9 mm; style 30-31 mm; ala blade 21-28 mm long, claw 17-25 mm.
4. Calyx lobes elongate, 15-19 mm long, more or less prominently 3-nerved with secondary nerves somewhat inconspicuous; ala blade elongate, 25-28 mm long, claw



23-25 mm; petiole 0.2-0.6 cm (rarely 1-2 cm) long, rachis 0.1-0.6 cm long; stipules ascending; flowers purplish to lavender; leaves 3-foliate with occasional 1-foliate leaves, conspicuously pubescent below (southeastern Brazil, Paraguay, Bolivia). . . . .

. . . . . 50. C. densiflora

4. Calyx lobes 10-15 mm long, conspicuously reticulate-nerved; ala blade 21-24 mm long, claw 17-20 mm; petiole 0.6-1.4 cm long, rachis 0.6-1.6 cm long; stipules ascending, becoming reflexed; flowers white; leaves 3-foliate only, sparsely pubescent below (central Brazil) . . . . . 51. C. irwinii

2. Bracteoles short, 6-12 (14) mm long; bracts short, 3-8 (9) mm long; stipules narrow, 1.5-4 (5) mm wide; stipules short, 4-9 (12) mm long; flowers commonly 1-2 (occasionally 4-6), typically racemose and separated when several flowers are borne; leaflets (of 3-foliate leaves) typically narrow, 0.6-3 cm wide (broad only in C. falcata and C. guianensis var. chapadensis).

5. Leaves subsessile to sessile; petiole absent or to 1 (1.5) cm long; rachis absent to 1 (1.5) cm long; pubescence of stem whitish to grayish-white; shrubs to subshrubs, stems erect borne from a subterranean xylopodium.
6. Leaves 3-foliate, occasionally bearing a few 1-foliate leaves (rarely only 1-foliate); leaflets elongate, ratio of length/width is 3-7:1; upper surface of leaflets

bearing uncinata trichomes (often obscure unless magnified 25-30X).

7. Calyx tube 11-15 (16) mm long, 6-9 mm broad at the throat; calyx lobes 6-9 mm long; bracteoles 6-9 mm long; bracts 2-4 mm; flowers 4-5.5 cm; stem pubescent dense, canescent; lower leaf surface densely pubescent, somewhat canescent; alae blade 17-21 mm; staminal tube 28-34 mm; shrubs to subshrubs (Caribbean, S. America, introduced into central Africa and Indonesia). . . . . 52. C. laurifolia
7. Calyx tube 15-23 mm long, 9-13 mm broad at the throat; calyx lobes 8-15 mm long; bracteoles 8-14 mm; flowers (5) 5.5-7.5 cm; stem pubescence sparse to moderate, whitish; lower leaf surface sparsely pubescent to glabrate; staminal tube 33-40 mm long; subshrubs to perennial herbs.
8. Leaves subsessile, pinnate; petiole and rachis present; style 24-30 mm; ovary densely uncinata-pubescent, macrotrichomes lacking; legume costate or costa imperfectly formed, occasionally lacking; leaflets typically (0.8) 1-2.5 (3) broad; leaves 3- (1-) foliate (Cuba, Central America, South America). . . . .  
. . . . . 53. C. guianensis
8. Leaves sessile, digitate; petiole and rachis absent; style 19-24 mm; ovary densely uncinata-pubescent with white, dense, macrotrichomes

- borne dorsally and ventrally; legume ecostate or occasionally costa very weakly formed, inconspicuous; leaflets typically narrow, 0.5-1.2 (1.7) cm wide; leaves 3-foliate only (southeastern Brazil, Paraguay, northern Argentina). . . . . 54. C. epetiolata
6. Leaves 1-foliate only; leaflets broadened, ratio of length/width is 1.5-2:1; upper surface of leaflets glabrous (Venezuela, Brazil). . . . . 55. C. simplicifolia
5. Leaves petiolate; petiole 1.5-6 (8) cm long; rachis 0.4-2.5 cm long; pubescence of stem rufus; herbaceous vines or prostrate herbs.
9. Flowers purplish; leaves with upper surface conspicuously pubescent; leaflets narrow, 1.2-1.6 cm wide; petioles short, (1) 1.5-2.5 cm; petiolules small, 2-3 mm long; prostrate herb with long flagellare branches; rare (state of Rio Branco, Brazil). . . . . 56. C. flagellaris
9. Flowers white, fading yellowish to orange; leaves with upper surface glabrous; leaflets broad, 1.5-5 (9) cm wide; petioles elongate, 2-6 (8) cm long; petiolules 3-5 mm long; herbaceous vine, branches twining; common (Central America, Caribbean, South America, introduced into W. Africa and Indonesia) . . . . . 57. C. falcata
1. Style length slightly longer than the length of the ovary; ovary pubescence of dense, white with yellowish tinged, macrotrichomes; staminal tube short, 18-22 mm; legume ecostate, uncinate and pilose-pubescent; bracteoles 1.3-2 mm wide; leaves sessile with

petiole (0.4-1.5 cm) subequalling to slightly longer than the rachis (0.3-0.9 cm); decumbent to ascending herb, stem to 35 cm long (Argentina, Paraguay, S. Brazil). . . . . 53. C. nana

49. Clitoria stipularis Benth., Journ. Linn. Soc. 2: 41. 1858.

Neurocarpum bracteatum Mart. ex Benth., Ann. Wein. Mus.

Natur. 2: 116. 1837.

Ternatea bracteata (Mart. ex Benth.) Kuntze, Riv. Gen. Pl.

1: 210. 1891.

Subshrub to perennial, suffrutescent herb, erect, to 0.5 m tall. Stem unbranched, 2-5 mm thick, apex angular becoming gradually terete and lignose toward base, pith hollow, internodes straight to weakly flexuous, 3-6 (8) cm long, juvenile stem densely pilose-hirsute, rufus, trichomes becoming whitened and scattered, stem glabrous with age. Xylopodium not observed (all specimens examined had stem cut above xylopodium). Leaves 3-foliate, petiolate, thick-membranaceous, leaflets oblong or oblong-elliptic to elliptic, apex broadly acute and mucronate or obtuse and emarginate, more or less mucronate, base rotund to broadly cuneate, midrib weakly raised above, primary nerves of 9-11 pairs, upper surface dark green, glabrous, lower surface dull green, glaucous, with moderately dense to scattered, spreading to subappressed trichomes borne mainly along the prominent nerves, lamina 3.5-13 cm long, 2.5-6 cm wide. Petioles angular to distinctly quadrangular, longitudinally striated, 2.5-4.5 cm long, pubescence of rufus, subhirsute trichomes; rachis 0.8-2.2 cm. Petiolules nearly quadrangular, becoming darkened, 3-8 mm long, sparsely pubescent. Stipules foliaceous, conspicuous,

broadly ovate, acute, striated with ca 25-30 nerves, sparingly pubescent, 13-19 mm long, 7-13 mm wide; stipels linear to lanceolate, sparsely ciliolate, lateral stipels 10-14 mm long, 2-3 mm wide, terminal stipels conspicuously smaller, 7-9 mm long, 1-2 mm wide. Inflorescence axillary, contracted-paniculate, several-flowered clustered at tip of peduncle; flowers chasmogamous; peduncles solitary, nearly straight, subterete, 2-5 cm long, usually bearing 2 rachides laterally from the slightly expanded apex, occasionally bearing 3-5 deciduous rachides, the rachis weakly flexuous, compressed to subterete, internodes 2-4 (8) mm long, pilose. Pedicels paired, 3-5 mm long, thickening in fruiting stage, pilose. Bracts striated, sparingly pilose, ciliate, inner pair deciduous, between pedicels, inconspicuous, 4-7 mm long, 1 mm wide, middle pair conspicuous, ovate to lanceolate, acuminate, persistent, concave around pedicels, becoming with age spreading and complicate to sometimes reflexed, 8-14 mm long, 2-4 mm wide, outer bract deciduous, between pedicels, 7-9 mm long, 2-3 mm wide. CHASMOGAMOUS FLOWERS showy, 5-6 cm, color unknown. Bracteoles thick membranaceous, ovate to ovate-lanceolate, acuminate, sparingly pilose, ciliate, elongated and broad, 16-24 mm long, 5-8 mm wide, inserted 0.5-1 mm below the calyx. Calyx pubescence of uncinata and sparsely to moderately dense, spreading trichomes of 2 mm long, tube 12-16 mm long, 3-6 mm wide at the base expanding to 8-11 mm wide at the throat, lobes ovate, long-acuminate, acumen to 2-5 mm long, ciliate, lobes slightly shorter than tube length, 11-14 mm long, 3-5 mm wide, ventral lobe 15-19 mm, apex drawn into a long subulate tip. Vexillum nearly glabrous except near apex, 3.5-4.5 cm in complicate position, 5-6 cm long when vexillum expanded, blade 3.5-4 cm wide, claw 8-12 mm, blade decurrent along claw. Alae extended

well beyond carina by 7-8 mm, blade 15-20 mm long, 5-9 mm wide, decurrent along claw of 13-16 mm. Carina falcate, acute, blade ca 12 mm long, 4-5 mm wide, claw 20-22 mm. Staminal tube 25-28 mm long, free filaments 3-4 mm; anthers lanceolate, 1-1.5 mm long, 0.5 mm wide. Gynophore 3-4 mm, densely uncinat-pubescent; ovary 6 mm long, 1 mm wide, densely uncinat-pubescent with white macrotrichomes dense, ascending, borne along a medial costa; style 20-28 mm long, geniculate 6-8 mm from the distal end; stigma capitate, ca 1 mm diameter, bearing white ascending hairs at its base. Legume stipitate, brown, costate, both sutures thickened, valves obliquely borne on stipe, nearly straight to subfalcate, convex, turgid at maturity, 4-5.3 (rarely 6.5) cm long, 10-13 mm wide, uncinat-pubescent; stipe 12-17 mm long; beak lacking or to 8 mm long; costa prominent, extending nearly the length of the valve, raised ca 0.5-1 mm above the surface, borne 3-4 from margin; dehiscence causing valves to twist (one-half) one to one and one-half turns. Seeds blackish-brown, viscid, cuboidal, lateral faces lenticular, pryiform to oblong, slightly longer than wide, 5-6 mm long, 4-5 mm wide, 3 mm thick, (5) 7-11 seeds per pod. CLEISTOGAMOUS FLOWERS not observed, or absent (?). Figure 105.

Stipular Clitoria is characterized as a woody herb with broad, foliaceous stipules, axillary inflorescences bearing several medium-sized flowers crowded at the apex of the peduncle, large bracteoles and bracts, and uncinat-pubescent legumes with a prominent costa.

PHENOLOGY: From what meager data exist, the reproductive season appears to be from April to August. Flowers have been collected in August and fruits have been collected in April and August.

Figure 105. Clitoria stipularis. Var. stipularis: (b) leaflet, x 1; (c) stipule, x 1; (d) inflorescence with immature flowers and fruits, x 1; (e) flower, x 1; (f) calyx, x 1; (g) vexillum, x 1; (h) ala and carina, x 1; (i) androecium, x 1; (j) gynoecium, x 1. Var. latifolia: (a) portion of stem, x 1; (k) legume, x 1; (l) three views of seed, x 1. (Kuhlmann 3238, RB 3238: b-j. Bollam 9, K-406: a. Fröes 1822, P-18: k-l.)





TYPE COLLECTION: BRAZIL. In sylvis Catingas ad Montem Sanctum et Prope fluv. S. Francisci, provinciae Bahiensis, nec non ad fluv. Parnaiba, Martius s.n. (Lectotype: M 12447; isolectotypes: M 12448 & 12449).

Bentham (1837) was the first to publish a description of this species. Bentham used the name Neurocarpum bracteatum which he obtained from the type specimen, collected and named by Carl Martius. Bentham cited only the one collection by Martius. There are three sheets of this collection at München, each stamped "vid. Bentham." Of these, only one sheet (M 12447) bears the name Neurocarpum bracteatum and has the complete data as cited by Bentham in 1837. Below the name N. bracteatum is the name Clitoria stipularis Bth. The other two sheets (M 12448 & 12449) bear abbreviated data as "Brasilia Provinc. Bahia, in sylvis Catingas ad M. Sanctum" and only one name, Clitoria stipularis Benth. The sheet which bears the complete data, including the specific epithet of Martius, is selected as the lectotype (M 12447). It bears both fruits and flowers, in addition to the vegetative material. Sheet two (M 12448) bears a nearly leafless stem with one flower and several inflorescences in which the stipe is present, but fruit are lacking. Sheet three (M 12449) bears nine mounted leaflets and a packet containing fruits and seeds. These pieces presumably came from the specimen mounted on sheet M 12448.

Bentham (1858) transferred the species from the genus Neurocarpum to the genus Clitoria, publishing the new name as C. stipularis. Neurocarpum bracteatum Mart. was cited in synonymy. Only the Martius collection was cited, but the data was abbreviated to "In sylvis Catingas Brasiliae provinciae Bahia (Martius)." Bentham made no comment

regarding his change in the specific epithet, although it is presumed that Bentham realized that Clitoria bracteata Mart. ex Benth. would become a homonym of C. bracteata Poir. (1811), and thus he renamed the species. The specific epithet designated by Bentham is well applied as this is the only species of Clitoria to bear the conspicuously broad stipules.

Index Kewensis (1894, fas. 3: 310) attributes the name Neurocarpum bracteatum Mart. to have been published by Walpers (Rep. 1: 753. 1842) and lacks any reference to the name having been published by Bentham five years prior to Walpers.

VERNACULAR NAME: BRAZIL (MARANHÃO): Feijão bravo (Rizzini, 1963).

NOTES: Clitoria stipularis appears to have close affinities with C. densiflora which is distinguished easily by the narrower stipules, subsessile leaves, longer calyx tube, longer floral structures, and the presence of occasional 1-foliate leaves. Clitoria stipularis is similar vegetatively in stem pubescence and in its leaflets to C. falcata, which is distinguished easily by the climbing habit, smaller stipules, bracteoles, and bracts, biflowered inflorescences, and the presence of cleistogamous flowers.

Rizzini (1963) described a form (f. latifolia) based upon the elliptic leaflets being obtuse and 4.5-7 cm wide. The character of leaflet width breaks down as both the typical form and Rizzini's form have nearly the same range in leaflet width of 3-6 (7) cm. However, these two groups are distinguished easily by the appearance of the leaflets, as well as in the size of the stipules, bracteoles, and petiolules. Rizzini's name is used for the nontypical group which has been emended in its description and elevated to the level of variety.

The leaflets give the false appearance of being broader than the leaflets of the typical variety because of decrease in length.

DISTRIBUTION (Figure 106): Clitoria stipularis is found in northeastern Brazil, in the states of Rio Branco, Ceará, Maranhão, and Bahia. Habitat data are scarce for this infrequently collected species which has been found in the campo and on rocky land near the top of a mountain (Ilha do Trauíra) near the sea coast. Elevations have not been recorded by the collectors.

KEY TO VARIETIES:

1. Leaflets oblong to oblong-elliptic, ratio of length/width is 2-3:1, apex acute, mucronate, lamina 7-13 cm long; stipules 7-9 mm wide; petiolules 4-8 mm long; bracteoles 17-24 mm long (Brazil, states of Rio Branco, Bahia). . . . . 49a. var. stipularis
1. Leaflets elliptic, ratio of length/width is 1.2-1.7:1, apex obtuse to emarginate, lamina 3.5-8 cm long; stipules 10-13 mm wide; petiolules 3-4 mm; bracteoles 16-19 mm long (Brazil, states of Ceará, Maranhão) . . . . . 49b. var. latifolia

49a. Clitoria stipularis Benth. var. stipularis

Neurocarpum bracteatum Mart. ex Benth., Ann. Wein. Mus.

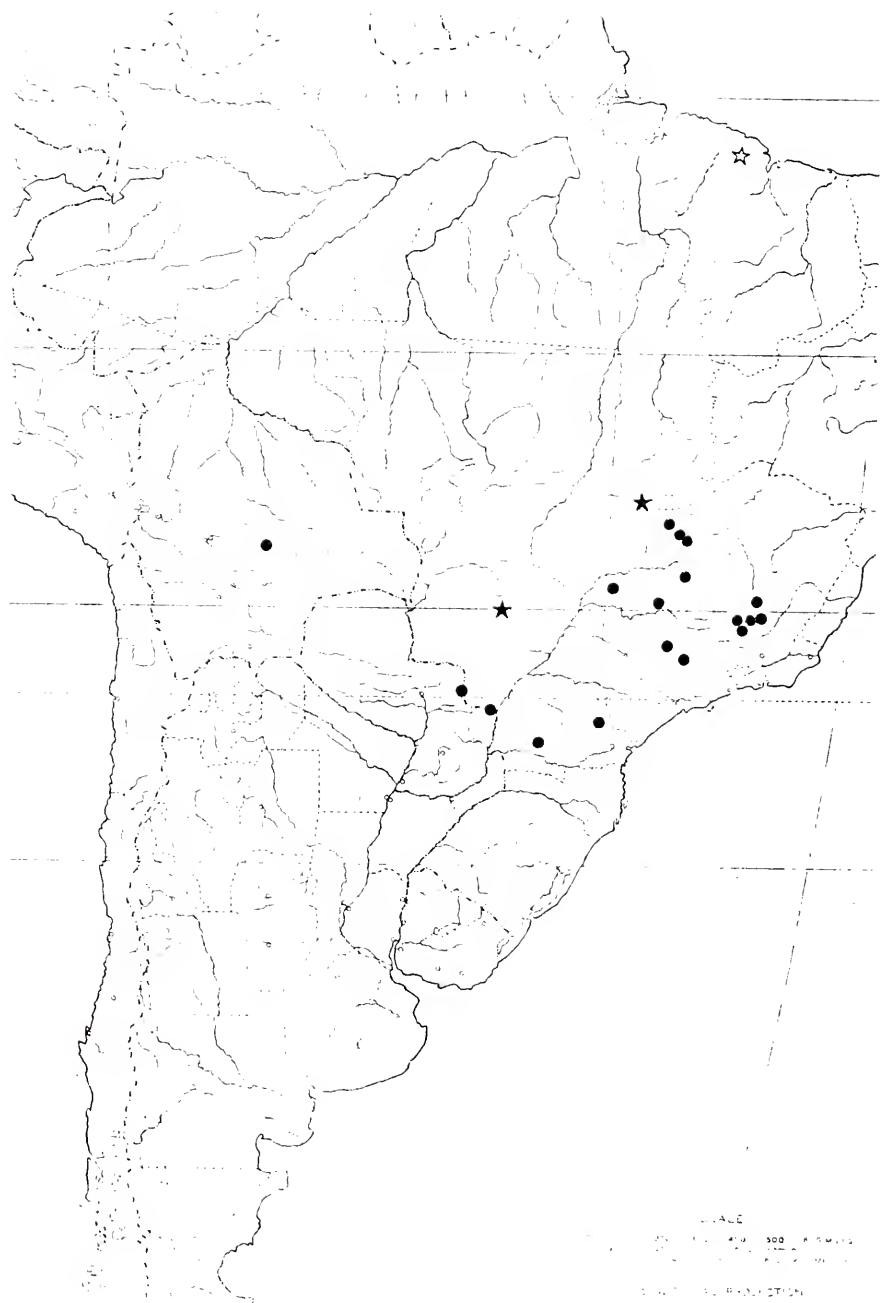
Natur. 2: 116. 1837.

Ternatea bracteata (Mart. ex Benth.) Kuntze, Riv. Gen. Pl.

1: 210. 1891.

Leaflets oblong to oblong-elliptic, acute, mucronate, 7-13 cm long. Petiolules 4-8 mm long. Stipules ovate, 7-9 mm wide. Bracteoles 17-24 mm long. Figure 105.

Figure 106. South American distribution of three species of section  
Neurocarpum. C. densiflora (●); C. irwinii (★);  
C. stipularis (☆).



DISTRIBUTION (Figure 106): The typical variety is found in Bahia, Brazil and with one collection from Rio Branco, Brazil, well outside the range of most individuals collected for this species.

B R A Z I L. RIO BRANCO: Amazonas, Rio Branco, Aug 1912, Kuhlmann 3238 (RB).

49b. Clitoria stipularis Benth. var. latifolia (Rizz.) Fantz,  
nov. stat.

Clitoria stipularis Benth. f. latifolia Rizz., Arq. Jard.  
Bot. Rio de Jan. 17: 181. 1963.

Leaflets elliptic, obtuse becoming emarginate, more or less mucronate, 3.5-8 cm long. Stipules broadly ovate, 10-13 mm wide. Petiolules 3-4 mm long. Bracteoles 16-19 mm long. Figure 105.

TYPE COLLECTION: BRAZIL. Maranhão: Rio Jurupy, Serra de Pirocana, 25 Apr 1909, Anonymous 10387 (LECTOTYPE: RB 5697. Isolectotypes: BM! G-319, Herb. Delessert! MG 10387, US 1044109!).

Rizzini cited one collection consisting of two specimens which he had examined. He did not designate which of the two specimens (RB or MG) was the type for his form. This author has seen only the specimen from the Herbario do Jardim Botânico do Rio de Janeiro, thus it is selected as the lectotype. The collector of the type specimen is unknown, but it was distributed through the Herbario do Museu Paraense Goeldi. The number cited in the type collection is the accession number for this herbarium, and may represent a collection by Ducke. Rizzini cited Ducke 10387 (R 2435-not seen) from Serra de Pirocana, Maranhão, which is the type locality for this variety. However, Rizzini cited Ducke

10387 under the typical variety. It is unknown to the author of this study whether the Ducke specimen is different from the nontypical variety, or whether an error had been made in the placement of the citation.

DISTRIBUTION (Figure 106): This variety is found on mountain slopes in northeastern Brazil.

B R A Z I L. CEARÁ: ca 10 mi from coast, 1928, Bollam 9 (K-2 sh.).

MARANHÃO: Maracassume River region, Ilha do Trauíra, 29 Aug 1932, Froés 1822 (G,GH,NY,P,S,U).

50. Clitoria densiflora (Benth.) Benth., Journ. Linn. Soc. 2:

41. 1858.

Neurocarpum densiflorum Benth., Ann. Wein. Mus. Natur. 2:

117. 1837.

Ternatea densiflora (Benth.) Kuntze, Riv. Gen. Pl. 1: 210.

1891.

Clitoria cajanifolia Benth. var. latifolia Chod. & Hass.,

Bull. Herb. Boiss. 4(2): 895. 1904.

Clitoria densiflora Benth. var. mucronulata Hass., Repert.

Nov. Regni. Veg. 8: 128. 1910.

Clitoria burkartii Rizz., Ark. Jard. Bot. Rio de Jan. 16: 55.

1959.

Neurocarpum densiflorum f. erectum Benth., nov. in sched.

Subshrub to perennial suffrutescent herb, erect, commonly 30-60 (90) m tall, occasionally with upper portion of stem becoming lax, herbaceous. Stems unbranched or occasionally bearing short branches

from near the base of the stem and terminating in a leaf, erect, nearly straight to arcuate above, 2-5 (8) mm thick, pith hollow, juvenile stem compressed angular, becoming terete, pubescence of juvenile stems densely hirsute-villous, rufus, becoming tawny and less dense, to finally nearly glabrate with whitish trichomes. Xylopodia rarely collected, subterranean; lignose; proximal portion 4-8 cm long, 5-15 mm thick, bearing 1-3 aerial stems from a knobby apex, bearing several root-like structures laterally which are 3-9 cm long, 1-3 mm thick and becoming lignose, to 7 mm thick; distal portion of xylopodium slender, unbranched, to 10+ cm long (usually broken), lignose, to 3-4 mm thick. Leaves commonly 3-foliate, occasionally 1-foliate; 3-foliate leaves subsessile; bearing leaflets elliptic-oblong which become broadened to obovate-oblong, apex acute to obtuse, occasionally truncate and retuse (typically in terminal leaflet only), more or less short-acuminate, mucronate, base cuneate, midrib weakly raised above, primary nerves yellowish above, of 7-10 pairs, nerves prominently raised below, honeycombed-reticulate, upper surface dark green, glabrous, lower surface green, sericeous-villosus pubescent below, lamina 5-11 cm long, 2.5-5 (6) cm wide, terminal leaflet usually broader than lateral leaflets; unifoliate leaves sessile, often borne on stem below trifoliate leaves or occasionally with all cauline leaves unifoliate, lamina broadly oblong to obovate-oblong, apex obtuse to truncate, 6-11 cm long, 3-7 cm wide. Petioles subsessile to rarely short, subquadrangular, commonly 0.2-0.6 cm long, occasionally to 1 cm long, rarely 1-2 cm long, densely sericeous; rachis 0.1-0.6 cm long. Petiolules nearly quadrangular, densely sericeous, 3-4 mm long on trifoliate leaflets, commonly 4-6 mm long on unifoliate leaflets. Stipules



conspicuous, lanceolate to ovate, acute, 7-13 (16) mm long, (3) 4-6 (8) mm wide, pubescence moderately dense, uncinata, ciliate, and with a few subappressed, 0.5-1 mm long trichomes; stipels linear to subulate, pubescence similar to stipules, lateral stipels conspicuous, 7-10 mm long, 0.7-1 mm wide, terminal stipel 3-7 mm long, 0.2-0.7 mm wide.

Inflorescence axillary, contracted-paniculate to racemose, several-flowered clustered at peduncle apex to 2-flowered; peduncle solitary, subterete, straight, 0.5-3 cm long, bearing 2-several flowers at its apex, axis densely pubescent, rachis internodes 1-5 mm. Pedicels 3-10 mm long. Bracts uncinata-pubescent with scattered, 1 mm long trichomes, conspicuous, middle pair lanceolate, concave around pedicels, 8-12 mm long, 3-4 mm wide, outer pair narrowly lanceolate, between the pedicels, 5-9 mm long, 2-3 mm wide. CHASMOGAMOUS FLOWERS showy, large, 5-7 (7.5) cm long, lavender-purple, with vexillum white toward base and bearing dark purple veins. Bracteoles lanceolate, acuminate, conspicuously large, 13-19 (22) mm long, 3-5 mm wide, inserted 0.5-1 mm below the calyx, pubescence uncinata, ciliate, and with 1 mm long trichomes. Calyx pubescence uncinata and villous, macrotrichomes somewhat stiff, 1-2 mm long, tube 10-nerved, (15) 17-20 (25) mm long, 4-6 mm wide at the base expanding to 9-13 mm wide at the throat, lobes oblong-lanceolate, acuminate ca 4-6 mm, 3-nerved, ciliate, lobes slightly shorter than to subequalling the tube, 15-19 mm long, 5-7 mm wide near base, ventral lobe 17-20 mm. Vexillum nearly glabrous except near apex, blade 4-4.5 cm wide, claw 9-10 mm. Alae extended well beyond carina by 9-12 mm, blade 25-28 mm long, 8-14 mm wide, claw 23-25 mm. Carina falcate, acute, blade 13-15 mm long, 4-5 mm wide, claw 27-32 mm long. Staminal tube 35-40 mm long, free filaments 4-5 mm long; anthers

1.2-1.3 mm long, 0.8 mm wide. Gynophore 3-4 mm long, densely uncinately pubescent; ovary 7-9 mm long, 1 mm wide, costate, densely uncinately pubescent; style 28-30 mm long, geniculate 4-6 mm from the distal end; stigma capitate, ca 1 mm in diameter. Legume stipitate, brown, costate, both sutures thickened, valves obliquely borne on stipe, nearly straight, turgid, 5-6 cm long, 8-11 mm wide, uncinately pubescent; stipe 8-12 mm long, enclosed within calyx; costa prominently formed, raised 1-2 mm above the surface of the valve, wing-like, borne 3-4 mm from margin; beak lacking to 5 mm long; dehiscence causing valves to twist from three-quarters to one turn. Seeds black, viscid, ovoid-cuboidal, face oval-oblong, 4-5 mm long, 3.5 mm wide, 3 mm thick, 7-12 seeds per pod. CLEISTOGAMOUS FLOWERS not observed, or absent (?). Figure 107.

Martius' Bracteate Clitoria is characterized as a subshrub with subsessile leaves which are trifoliate or unifoliate, conspicuously pubescent below, rufous to tawny pubescent stems bearing short inflorescences of large, purplish flowers and legumes with a thick, prominent costa. Bracteoles and stipules are very conspicuous and large in size.

PHENOLOGY: This species has been collected in flower from August through January, with fruits collected in late January through February.

TYPE COLLECTION: BRAZIL. Ad Rio S. Marcos, Paracutu, ad Oliveria, Minas Gerais, Pohl 752,381 (LECTOTYPE: W. Isolectotypes: F 870011-frag., NY, K 24-Herb. Benth., S-photo of K).

Bentham (1837) described the species based only upon one collection citing the full citation as above. Bentham placed the species under the genus Neurocarpum, but nearly two decades later (1858), he transferred the species to the genus Clitoria when he combined Neurocarpum with

Figure 107. Clitoria densiflora. (a) habit, x 1; (b) flower, x 1;  
(c) calyx, x 1; (d) vexillum, x 1; (e) ala and carina,  
x 1; (f) androecium, x 1; (g) gynoecium, x 1;  
(h-i) legumes, x 1; (j) three views of seed, x 1.  
(Steinbach 2875, A: a. Regnell III438, S: c-g. Hassler  
9831, G 773-4: b,h. Regnell III438x, S: i-j.)



Clitoria. Bentham did not designate a holotype. All four specimens of the type collection examined by this author were examined by Bentham. Each is designated as a duplicate from the Herbarium Musei Hist. Nat. Vindobonensis. Only the New York specimen bears the complete data that is also found on the Wein specimen. The Wein specimen is designated as the lectotype because it is the more probable specimen upon which Bentham based his description and name. It has full data plus the plant agrees with Bentham's original description, especially in having a "volubile stem" and having the lower peduncles ca 1 inch long with the upper peduncles being shorter.

When Bentham transferred the species from the genus Neurocarpum to the genus Clitoria in 1858, he cited two additional collections (Weddell & St. Hilaire). Since the species was not newly described, these two collections are not regarded as type collections.

The author of the present study has examined a photograph of the type specimen of C. burkartii (HOLOTYPE: Paraguay, Pedro Juan Caballero, Sierra de Amambay, ad campos elevatos, Jan 1934, Rojas 6729 (SI). The description of the plant agrees with C. densiflora and the photograph of the type confirms the placement of C. burkartii in synonymy with C. densiflora.

VERNACULAR NAMES: BOLIVIA (SANTA CRUZ): Semelos, Steinbach 2875.

NOTES: Hassler described a variety based upon the apex of the leaflet and the stem pubescence, but both characters break down. His type (Hassler 9831) agrees with the Pohl specimens. Lateral leaflets are commonly acute, more or less short-acuminate and mucronate, and as the leaflets mature, they become broader. Terminal leaflets are typically broad, often obtuse to truncate, and typically short-acuminate

to retuse. Stem pubescence is commonly dense with rufus trichomes toward the apex, the trichomes becoming less dense with age and more or less tawny, then whitened. A similar pubescence is observed in C. falcata. With a breakdown in the diagnostic characters, Hassler's variety is not recognized.

Plants commonly bearing the name C. cajanifolia var. latifolia are typically misidentified as the type collection (Hassler 5062) agrees with both the Pohl and Hassler 9831 collections. Clitoria laurifolia (synonym C. cajanifolia) is easily distinguished by its canescent stem, smaller flowers, bracteoles, calyx, stipules, and bracts, narrower leaflets, and the production of cleistogamous flowers.

Clitoria densiflora has close affinities with C. stipularis which is distinguished by its broad stipules, petiolate leaves, and shorter calyx and floral structures. Some individuals appear to have close similarities with members of C. falcata var. aurantiaca, which is distinguished by its twining habit, smaller bracteoles and stipules, and usually narrower petiolate leaves. A few individuals of C. densiflora from Paraná, Brazil, appear to have some hybrid characteristics with a more lax stem, a somewhat viney appearance (although there is no evidence of twining), short-petiolate leaves, and bracteoles and stipules intermediate in size between the two species. Biosystematic studies on these groups would help clarify their relationships.

DISTRIBUTION (Figure 106): This species is found in southeastern Brazil, with isolated collections from Bolivia and Paraguay, commonly collected from the cerrado and mountain slopes at elevations of 740-1000 m.

LOCALITY UNKNOWN. A.S.H. 2338 (P); Hb. Zuccarin s.n. (M 12478).

BRAZIL. LOCALITY UNKNOWN: Regnell III438b (S); Sellow 5037 (F-frag.); 1858, Weddell 1749 (G-3 sh.); Prov. St. Paul & Rio, 1861-1862, Weir 129 (K). GOIAS: Cristalina, 2 Feb 1967, Heringer 11340 (NY). MINAS GERAIS: 1835, Claussen s.n. (NY); Regnell I-61 (S); Regnell III-438x (S); 1845, Widgren s.n. (S-2 sh.); prope S. Francisco in Chagas, 1844, Weddell 1835 (P); ca 35 km NW of Paracutú, 1000 m, 8 Feb 1970, Irwin et al. 26317 (NY); ca 4 km NW of Patrocínio, 1000 m, 31 Jan 1970, Irwin et al. 25732 (GH,MO,NY,RB-2 sh.,UMO); ad Lagoa Santa, 21 Nov 1863, Warming 3049 (F,G); prope Ouroprêta, 1844, Weddell 1749 (P); de environs de Congonhas, Sipolis 29 (P); São João de El Rei, 1889, Glaziou 17589 (G); inter Uberana et Melanas [?], 29 Nov 1848, Regnell III-438 (S-2 sh.,US); Mun. Ituiutaba, 16 Oct 1943, Macedo 101 (US) and 108 (MO,US); l.c., 16 Oct 1949, Macedo 1958 (US); Caldas, Salvador, Nov 1853, Regnell III-430x (S); Caldas, 15 Feb 1877, Regnell III-438x (S-2 sh.). PARANÁ: Jaguariahyva, 20 Nov 1914, Dusén 15964 (S); l.c., 30 Dec 1914, Dusén 16215 (G,S); Villa Velha, 27 Nov 1908, Dusén 7249 (S); Fortaleza, 22 Dec 1903, Dusen 2839 (S); km 127 (mun. Laranjeiras do Sul), 10 Dec 1968, Hatschback & Guimaraes 20605 (UC); l.c., 850 m, 5 Dec 1969, Hatschbach & Ravenna 23126 (UC). SAO PAULO: inter Canna Verde et Cajurú, 28 Oct 1855, Regnell III-438 (S).

PARAGUAY. ALTO PARANA: Sierra de Maracayu, 2 Oct 1898, Hassler 5062 (Syntype of synonym C. cajanifolia var latifolia: (BM, G-4 sh.,NY). AMAMBAY: Sierra de Amambay, Dec 1907, Hassler 9831 (Syntype of synonym C. densiflora var. mucronulata: B1,F,G-5 sh.,MPU, NY,S,UC,W).

B O L I V I A. SANTA CRUZ: Buena Vista, 450 m, 29 Nov 1916,  
Steinbach 2875 (A,U).

51. Clitoria irwinii Fantz, sp. nov.

Subshrub to perennial, suffrutescent herb, erect, 25-75 cm tall. Stems unbranched or occasionally bearing a few branches from near base, erect, lignose, 4-7 mm thick, pith minutely hollow, juvenile stems compressed quadrangular, become terete with longitudinal striations, pubescence of juvenile stem with conspicuous, dense, white, 1-2.5 mm long, shaggy trichomes which are subappressed becoming spreading to reflexed, then dropping to expose a layer of moderately dense, uncinat trichomes, these in turn deciduous such that stem becomes glabrate. Xylopodia subterranean, vertical, lignose, knobby at apex from which 1-2 aerial stems are borne, 3-5 cm long, 6-12 mm thick, distal portion not collected; adventitious roots occasionally borne on lower stem axis above xylopodium, extending laterally through soil, 9-17 cm long, 1-2 mm wide, lignose, sparsely branched. Leaves 3-foliate, thick-membranaceous to subcoriaceous, subsessile, oblong to elliptic-oblong to ovate-oblong, apex obtuse, sometimes retuse, mucronate, base rotund to weakly cordate, midrib weakly raised above, primary nerves more or less yellowish, of 8-11 primary nerves, upper surface dark green, dull, glabrous, lower surface green, pubescence of scattered, subappressed to spreading, 1.5-2.5 mm long trichomes, mainly along nerves, lamina 5.5-11 cm long, 2.5-5 (6) cm wide. Petioles nearly quadrangular, somewhat compressed, slightly shorter than the rachis length, 0.5-1.3 cm long, pubescence of uncinat and scattered, spreading to reflexed, shaggy



trichomes; rachis similar to petiole, 0.6-1.6 cm long. Petiolules quadrate, 2-4 mm long, pubescence of uncinata and moderate to dense, 1-2.5 mm long, ascending to spreading trichomes. Stipules oblong to ovate-oblong, acute, ascending to sometimes reflexed in age, sparsely-pubescent, conspicuous, 20-30 nerved, 10-15 mm long, 4-7 mm wide; stipels linear, acute, sparsely pubescent, 1-5 nerved, lateral stipels 8-12 mm long, 1-1.5 mm wide, terminal stipels 4-9 mm long, 0.2-0.8 mm wide. Inflorescence axillary, solitary, subsessile, few-several flowered (4-8 flowers) crowded at apex of peduncle, axes pubescent, more or less purplish; peduncle 2-5 mm long, bearing chasmogamous or cleistogamous flowers. Pedicels 4-6 mm. CHASMOGAMOUS FLOWERS showy, 5-6 cm long, white, vexillum with purplish veins. Bracts large, crowded, lanceolate, acute, 9-12 mm long, 1-2 mm wide, with pubescence of long, shaggy trichomes. Bracteoles elongate, oblong, tapering rapidly near apex to an acute tip, base broadly cuneate to rotund, 19-21 mm long, 4-6 (7) mm wide, inserted ca 1 mm below calyx, pubescence of long, shaggy trichomes. Calyx pubescence of long (2-3 mm), white, shaggy trichomes, tube 10-nerved, 17-18 mm long, 5-6 mm wide at the base to 8-10 mm wide at the throat, lobes ovate-oblong, 10-15 mm long, 4-5 mm wide, acuminate with acumen ca 4-5 mm, basically 3-nerved with reticulate veins highly conspicuous and prominent in the dried state, ciliate-pubescent of long, somewhat ascending trichomes. Vexillum glabrate or sparsely uncinata, blade 3.5-4 cm wide, claw ca 9 mm long with decurrent blade. Alae extended well beyond carina by 8-11 mm, blade 21-24 mm long, 6-8 mm wide, claw 17-20 mm. Carina falcate, acute, 11-15 mm long, 5 mm wide, claw 25-26 mm. Staminal tube 34-35 mm long, vexillary stamen coherent near base, free filaments 3-6 mm; anthers lanceolate, 1.5 mm long,

0.5 mm wide. Gynophore 4-5 mm, densely uncinat-pubescent; ovary costate, 9 mm long, 1 mm wide, densely uncinat-pubescent; style 29-30 mm long, geniculate 9 mm from the distal end; stigma capitate. Legume borne from chasmogamous flowers not observed. CLEISTOGAMOUS FLOWERS minute, inconspicuous, crowded in axils. Bracts 3-5 mm long, 1.5-2 mm wide. Bracteoles lanceolate, acute, 4-7 mm long, 1-1.5 mm wide. Calyx pubescence short-pilose, tube 4-7 mm long, 2-3 mm wide at throat, lobes lanceolate, acute, 3-4 mm long, 1.5 mm wide. Staminal tube ca 0.5 mm long, free filaments 2-3 mm; anthers elliptic, ca 0.6 mm long, 0.4 mm wide. Gynoecium not observed. Legume short-stipitate, green becoming brown in dried state, costate, turgid, uncinat-pubescent, valves with slightly thickened sutures, 2.5-4 cm long, 7-9 mm wide; stipe 5-6 mm; costa imperfectly formed, raised ca 0.5 mm above the surface of the valve, extending from distal end to one-half to three-fourths the length of the valve, becoming impressed into the surface near the base, costa nearly medial, 4-5 mm from either margin; beak lacking to 4 mm long; dehiscence causing valves to twist slightly from one-quarter to one-half of a turn. Seeds not observed; ca 1-4 seeds per pod.

Figure 108.

Irwin's Clitoria is characterized as a subshrub with large stipules, subsessile, 3-foliate leaves, subsessile inflorescences bearing crowded, white flowers with conspicuously elongated bracts and bracteoles, and bearing legumes with an imperfectly formed, thin medial costa. The long, white shaggy trichomes found upon the axes, calyx, and bracteoles are typical of this species.

PHENOLOGY: The reproductive season appears to be from January to June. Chasmogamous flowers were collected in January and cleistogamous

Figure 108. Clitoria irwinii. (a) habit, x 1; (b) petiole, rachis, and stipels, x 1; (c) vexillum, x 1; (d) bracteole, x 1; (e) ala and carina, x 1; (f) androecium, x 1; (g) gynoecium, x 1; (h) inflorescence with cleistogamous flowers and stipes, x 1; (i) cleistogamous flower, x 1; (j-k) legumes, x 1; (l) inner view of legume, x 1; (m) three views of seed, x 1. (Irwin, Maxwell, & Wasshausen 18759, NY: a-g. Irwin et al. 16509, US 2636420: h-m.)



flowers with its fruit in the immature stages were collected in January, and collected with dehiscent fruits in early June.

TYPE COLLECTION: BRAZIL. Erect herb or subshrub to ca 25 cm tall; corolla white with violet lines within; fruit green; sandstone outcrops and sandy cerrado, 20 km N of Corumbá de Goiás on road to Niquelândia, in valley of Rio Corumbá, Goiás, 1150 m, 18 Jan 1968, Irwin, Maxwell, & Wasshausen 18759 (HOLOTYPE: NY).

The description is based upon three collections of Irwin et al. The collection selected as the holotype has both chasmogamous flowers and cleistogamous flowers, the latter in fruit. The leaves are younger than those found on some of the duplicates of the paratype Irwin et al. 16509.

NOTES: This species appears to have close affinities with C. densiflora which is distinguished by its purplish flowers, larger calyx and wings, shorter petioles, and occasional 1-foliate leaves. Clitoria irwinii also appears to be related to C. guianensis var. chapidensis which is distinguished by the pedunculate chasmogamous flowers, lavender-purplish flower color, smaller stipules, and leaflets bearing uncinete trichomes on the upper surface (sparse and inconspicuous) and having a cuneate base. The typical variety of C. guianensis is easily distinguished by its narrow leaflets and appears strikingly distinct from C. irwinii.

These specimens of C. irwinii have been misidentified as C. cajanifolia var. latifolia. Clitoria laurifolia (synonym C. cajanaefolia) is distinguished by its smaller flowers, more elongated, narrower leaflets, and smaller stipules, bracts, and bracteoles.

DISTRIBUTION (Figure 106). This species is infrequently collected, found in cerrado and sandy outcrops of Goias and Mato Grosso, Brazil, at elevations of 550 m to 1150 m.

B R A Z I L. GOIAS: 15 km N of Corumba de Goias on road to Niquelandia, valley of Rio Corumba, 1150 m, 14 Jan 1968, Irwin, Maxwell, & Wasshausen 18590 (Paratype: NY). MATO GROSSO: ca 86 km N of Xavantina, Serra do Roncador, 550 m, 3 Jun 1966, Irwin et al. 16509 (Paratypes: MO 2114394, NY, RB 160173, US 2636420); Santa Anna de Chapada, 8 Sep 1902, Malme 2141D (S).

52. Clitoria laurifolia Poir in Lam. Ency. Supp. 2: 301. 1811.

Neurocarpum janensis Desv., Journ. Bot. 1: 1814.

Clitoria erecta Roxb., Hort. Bengal. 56. 1814; nom. nud.

Neurocarpon laurifolium (Poir.) Desv. in Ham. Prod. Pl. Ind.

Occ. 51. 1825.

Lotus fluminensis Vell., Fl. Flum. 7: 312, table 132. 1825.

Neurocarpum cajanifolium Presl., Symbol. Bot. 17, table 9.

1832.

Neurocarpum retusum Hassk., Pl. Java Rar. 376. 1848.

Neurocarpum erectum (Roxb.) Voigt, Hort. Subur. Cal. 213.

1845.

Clitoria cajanifolia (Presl.) Benth. in Mart. Fl. Bras.

15(1): 121. 1862.

Ternatea laurifolium (Poir.) Kuntze, Riv. Gen. Pl. 1: 210.

1891.

Martiusia laurifolia (Poir.) Britton, Sc. Surv. Porto Rico 412.

1924.

Neurocarpum emarginatum Moricand, nom. in sched.

Neurocarpum blanchetianum Moricand, nom. in sched.

Neurocarpum blanchetianum DC., nom. in sched.

Shrub to subshrub, erect, to 2 m tall, usually sparsely branched, branches borne near base or infrequently short branches are borne from the middle nodes, stems arising from apex of subterranean xylopodium and also infrequently borne from horizontal runners. Stems rigid, lignose, longitudinally striated, 2-7 mm thick, pith hollow, juvenile stems angular, becoming nearly terete, pubescence of juvenile stems canescent, moderately dense, trichomes 0.5-1 mm long, subappressed or infrequently spreading, becoming thinned with age. Xylopodium subterranean, lignose, nearly vertical, 4-14 cm long, 2-12 mm wide, apex knobby bearing 1-5 aerial stems and infrequently 1-4 horizontal stolons, middle portion bearing 1-4 slender, lignose, root-like structures up to 0.5 m long, 1-2 mm thick; stolons horizontal, rooting infrequently, bearing aerial stem at apex and occasionally at various nodes. Leaves 3-foliate, thick, membranaceous, leaflets oblong to elliptic-oblong, apex obtuse, retuse to emarginate, mucronate on smaller leaflets, base cuneate, midrib impressed above, primary nerves of 7-10 pairs, upper surface dull, dark green, nearly glabrous bearing moderately to sparsely, inconspicuous uncinat trichomes near midrib, lower surface canescent, trichomes subappressed to spreading, dense on juvenile leaflets, becoming moderate to thinly sericeous, occasionally to nearly glabrate, lamina 4-10 (13) cm long, 1.3-3 (3.5) cm wide. Petiole subsessile, conspicuously shorter than the rachis, 0.2-0.4 (0.5-1) cm long, canescent; rachis 0.4-0.9 (1-1.5) cm. Petiolules dark, subquadrate,

2-3 mm long. Stipules ovate-deltoid, acute, 4-7 (8) mm long, 3-4 mm wide, infrequently reflexed, sparsely pubescent; stipels linear to subulate, 2-5 mm long, 0.5-1 mm wide, terminal stipels usually somewhat shorter. Inflorescences axillary, racemose, usually 1-2 per node, infrequently 3 per node, rarely 5-8 per node, usually bearing 1-3 chasmogamous or cleistogamous flowers each; peduncle nearly straight to arcuate, 1.5-7 (10) cm long; rachis 2-10 mm long. Pedicels 4-6 mm. Bracts small, 2-4 mm long, strigose, inner pair caducous, middle pair ovate, opposite pedicels, 1.5-2 mm wide, outer pair lanceolate, between the pedicels, 0.7-1 mm wide. CHASMOGAMOUS FLOWERS showy, white to pale lilac or pale violate, 4-5.5 cm long. Bracteoles ovate-lanceolate, apiculate to short-acuminate, 6-9 mm long, 4-5 mm wide, inserted to 1 mm below calyx, juvenile bracteoles canescent toward margins and apex. Calyx pubescence more or less canescent, trichomes subappressed to spreading, tube 10-nerved, 11-15 (16) mm long, 4-5 mm wide near the base expanding to 6-9 mm wide at the throat, lobes ovate, short-acuminate, 6-9 mm long, 3-4 mm wide, ventral lobe 7-10 mm long. Vexillum sparsely pubescent, blade 2.5-4 cm wide, claw 5-7 mm. Alae extended beyond carina 5-8 mm, blade 17-21 mm long, 5-7 mm wide, claw 13-16 mm. Carina 10-11 mm long, 4-5 mm wide, claw 18-22 mm. Staminal tube 28-34 mm long, free filaments 2-3 mm; anthers 1-1.5 mm long, 0.5-0.8 mm wide. Gynophore 3-4 mm; ovary costate (costa sometimes imperfectly formed, rarely absent), 6-8 mm long, 0.7-0.8 mm wide, densely uncinat-pubescent; style 19-23 mm long, geniculate 6-8 mm from the distal end; stigma capitate, 0.5-0.7 mm diameter. Legume stipitate, costate or rarely ecostate, both sutures thickened, valves borne obliquely on stipe, nearly straight, turgid becoming subtetragonal at



maturity, nearly glabrous or sparsely uncinat-pubescent, (3.2) 3.7-6.5 cm long, 8-11 mm wide; stipe 9-11 mm long, enclosed within calyx tube; beak to 8 mm long, costa extending nearly the entire length of the valves, 3-4 mm from the margin, occasionally imperfectly formed, extending from one-quarter to slightly over one-half the length, becoming impressed toward the base, rarely absent; dehiscence causing valves to twist one-quarter to three-quarters of a turn. Seeds black, globular, viscid, slightly longer than wide, 5 mm long, 4-5 mm wide, 3-4 mm thick, hilum circular, ca 1 mm diameter. CLEISTOGAMOUS FLOWERS minute, typically borne at lower nodes. Bracteoles (3.5) 4-5 mm long, 1-2 mm wide. Calyx tube 5-7 mm long, 1.5-2 mm wide at the base expanding to 2-4 mm wide at the throat, trichomes appressed canescent, lobes ovate, acuminate, 2-4 mm long. Petals not observed. Staminal tube 0.5-1.5 mm, free filaments 1.5-2 mm; anthers suborbicular, ca 0.7 mm diameter. Gynophore 1.5-2 mm long; ovary 3-4 mm long, costate or imperfectly costate, densely uncinat-pubescent; style 3-4 mm long, abruptly bent back upon the ovary in contact with the anthers; stigma deltoid-capitate, ca 0.5 mm. Legume similar to those from chasmogamous flowers, more frequently collected, shorter, 2.5-4.5 cm long; stipe 6-13 mm, exerted beyond calyx tube. Seeds as those from fruits of chasmogamous flowers. Figures 109 and 112.

Poiret's Clitoria is characterized as a shrub with sessile, 3-foliate leaves with oblong leaflets canescent below, pedunculate inflorescences bearing medium-sized, white to pale purplish flowers or minute cleistogamous flowers, and with costate fruits.

PHENOLOGY: This species has been collected in every month of the year bearing predominantly cleistogamous flowers and fruits.

Figure 109. Clitoria laurifolia - I. Var. laurifolia: (a) habit, x 1; (b) flower, x 1; (c) calyx, x 1; (d) vexillum, x 1; (e) ala and carina, x 1; (f) androecium, x 1; (g) gynoecium, x 1; (h-i) legumes, x 1; (j) three views of seed, x 1. (Saltzmann s.n., G-58: a. Smith 2050, GH: b-j.)



Chasmogamous flowers are borne less frequently, and often with cleistogamous flowers occurring at lower nodes. Fruits from chasmogamous flowers are infrequently collected, occurring in every month but August. Chasmogamy appears more frequently from October through April, infrequently from May to July and uncommonly in August through September. Cleistogamy appears more frequently from September through June and infrequently in July and August.

TYPE COLLECTION: Puerto Rico. Savanne, 3 pied, Ledru 71 (LECTOTYPE: P-60, Herb. Poiret in Herb. Moquin-Tandon. Isolectotype: G-40, Herb. de Candolle: fragment.

Poiret published the name C. laurifolia citing "Cette plante m'a été communiquée par M. Ledru, qui l'a recueillie à Porto-Ricco, dans les Savannes." There are two specimens of this type collection. The specimen in Poiret's Herbarium deposited at Paris is designated as the lectotype because it is the probable specimen upon which the name was based. The cited data agrees with the data on the specimen label. The specimen includes a portion of the stem with leaves, a vexillum glued to the herbarium sheet, and a seed and a cleistogamous flower with juvenile fruit placed in a packet. Poiret's description included the vexillum, seed, and fruit. The specimen deposited at Geneva is a fragment of the stem with two leaves and short axillary inflorescences bearing stipes from flowers that were probably cleistogamous.

VERNACULAR NAMES: BRAZIL (GUANABARA): Chocalho, Machado 614. VENEZUELA (AMAZONA): Timbo, Black 48-2403 and Ducke 24322. (BOLIVAR): Generala, Williams 12940. APÛRE): Generala, Pittier (1944).

The name "Generala" is more commonly applied to C. guianensis, a species often confused with C. laurifolia.

ECONOMIC IMPORTANCE: Clitoria laurifolia is commonly cultivated as an ornamental shrub or as a hedge plant. Holland and Joachim (1933) and Burkill (1935) noted that this species is well adapted as a hedge plant to control terraces on steep slopes in Sri Lanka. Uphof (1968) and Burkill (1935) reported the species is used as a green manure. The leaves are used for pimples in Batavia (Java) according to Heyne (1927) and Burkill (1935). This species may have potential use as a pesticide, similar to C. macrophylla. Norris 278 reported that a cultivated population in São Paulo, Brazil, was not attacked by fungus or insects.

NOTES: Clitoria laurifolia is commonly confused with C. guianensis which is easily distinguished by the larger flowers, longer bracteoles and calyx, the glaucescent, sparsely pubescent lower surface of the leaflets and the occasional production of 1-foliate leaves. A number of structures are compared in Table 14.

This species is widely distributed, but the degree of variation within the species is very small when compared to comparable species of similar size and distribution within Clitoria. Most structures tend to be highly consistent. The medial costa on the legume is one structure that exhibits sporadic variation throughout the range of the species in the neotropics. A number of individuals will exhibit an imperfectly formed costa which will extend along the valve only twenty-five to sixty percent of its length, becoming subimpressed to impressed toward the base. Rarely, the costa will be completely absent on the legume valves. Individual plants will have legumes borne which can exhibit fruits that are ecostate, imperfectly costate of varying degrees, to

Table 14. A Comparison of *C. guianensis* (Aubl.) Benth. and *C. laurifolia* Poir.

CHARACTER	GUIANENSIS	LAURIFOLIA
Lower surface of leaf:	sparsely pubescent along nerves	canescent pubescent
Upper surface of leaf:	uncinate-pubescent	glabrous or sparsely uncinat-pubescent
Stipule length:	6-12 mm	4-7(8) mm
Petioles:	0.2-1(1.5) cm	0.2-0.4(0.5) cm
Bracteole length:	8-14 mm	6-9 mm
Bracts:	4-9 mm	2-4 mm
Flower size:	large, 5.5-7.5 cm	medium, 4-5.5 cm
Calyx tube length:	16-22 mm	11-15 mm
Tube width at throat:	8-13 mm	6-9 mm
Calyx lobes	9-15 mm	6-9 mm
Calyx pubescent:	uncinate & pilose	appressed, +/- canescent
Gynophores:	6-8 mm	3-4 mm
Styles:	24-30 mm	19-23 mm
Vexillum claw:	7-11 mm	5-7 mm
Carina blades:	11-15 mm	10-11 mm
Carina claw:	22-31 mm	18-22 mm
Ala blades:	21-28 mm	17-21 mm
Ala extended beyond carina:	7-12 mm	5-8 mm
Staminal tube, cleistogamous flowers:	0.5 mm	0.5-1.5 mm

those which are nearly costate. The same pattern of costa formation can be observed in the legumes of C. guianensis and C. falcata.

Other variations observed occur much less frequently, and in a much smaller geographic area. Inflorescences are typically solitary or occasionally paired. Infrequently, specimens from the state of Bahia, Brazil, exhibit a fascicled arrangement of inflorescences at a node. Petioles are commonly less than one-half of a centimeter in length, although specimens from French Guyana exhibit petioles nearly doubled in length. Each of these variations is minor, and treated taxonomically at the level of forma.

In comparing specimens collected from the paleotropics with those from the neotropics, it becomes apparent that the leaflets of the paleotropic individuals are slightly smaller, never attaining the length and breadth of some of the leaflets found in neotropical individuals. Leaflets commonly reach only to 7 cm in length and 2.5 cm in width. A number of specimens from the neotropics will agree in leaflet size with those of paleotropic members, thus no taxonomic status is recognized for this variation. In the state of Bolivar, Venezuela, there occurs an individual with very small leaves and a slightly longer rachis. Pittier recognized this individual as a new species, C. parvifolia. The differences from C. laurifolia are minimal, thus the author of this study is combining these two species and recognizing Pittier's entity at the level of forma.

DISTRIBUTION (Figures 85, 104, 110, and 111): Clitoria laurifolia is native to the neotropics and introduced and established in portions of the old world (i.e. mainly in Zaire, Sri Lanka, Malaysia, and several Indonesian islands). This species is common in many islands of the

Caribbean and in South America from eastern Venezuela to southern Brazil. Plants are often collected near the coast, commonly found in meadows or open grasslands behind the dunes, as well as inland in savannas and occasionally pine forests. The species is associated with sandy soil, and reported to be found in areas of very dry to somewhat wetter soils, from near sea level to elevations of ca 800 meters.

KEY TO FORMS:

1. Petioles (1) 2-4 (5) mm long.
  2. Leaflets oblong to elliptic-oblong, large, 4-10 (13) cm long, 1.5-3 (3.5) cm wide; petioles 2-4 (5) mm; rachis 4-9 mm.
  3. Peduncles solitary per node, rarely paired.
    4. Legume with prominently raised costa more perfectly formed, extending ca seventy-five to ninety percent of the length of the valve (all legumes similar)  
(S. America, W. Indies, Africa, SE Asia-Indonesia)  
..... 52a. f. laurifolia
    4. Legume with weakly raised costa imperfectly formed, extending ca twenty to sixty percent of the length of the valves, or ecostate (often a mixture of costa types on an individual plant, rarely with legumes from chasmogamous flowers nearly perfectly costate and those from cleistogamous flowers exhibiting imperfect costas)  
(S. America, W. Indies) ..... 52b. f. glabrior
  3. Peduncles fascicled per node with 2-7 peduncles (Brazil)  
..... 52c. f. fasciculata
2. Leaflets oblong-linear, small, 2.5-3.5 cm long, 0.7-1.3 cm



wide; petioles nearly lacking, 1-1.5 mm long; rachis 7-13 mm

(Venezuela) . . . . . 52d. f. parvifolia

1. Petioles 5-10 mm long (French Guyana) . . . . . 52e. f. petiolata.

52a. Clitoria laurifolia Poir. f. laurifolia

Neurocarpum janensis Desv., Journ. Bot. 1: 1814.

Neurocarpon laurifolium (Poir.) Desv. in Ham. Prod. Pl. Ind.

Occ. 51. 1825.

Lotus fluminensis Vell., Fl. Flum. 7: 312, table 132. 1825.

Neurocarpum cajanifolia Presl. Symbol Bot. 17, table 9. 1832.

Neurocarpum retusum Hassk., Pl. Java Rar. 376. 1848.

Clitoria cajanifolia (Presl) Benth. in Mart. F. Bras.

15(1): 121. 1862.

Ternatea laurifolium (Poir.) Kuntze, Riv. Gen. Pl. 1: 210.

1891.

Martusia laurifolia (Poir.) Britton, Sc. Surv. Porto Rico

412. 1924.

Neurocarpum emarginatum Mroicand, nom. in sched.

Neurocarpum blanchetianum DC, nom. in sched.

Leaflets oblong to elliptic-oblong, 4-10 (13) cm long, 1.5-3.5 cm wide. Petiole 2-4 (5) mm; rachis 4-9 mm. Inflorescences solitary, rarely paired per node. Legume with prominent costa on valves extending from three quarters to nearly the length of the valves.

DISTRIBUTION (Figures 85, 104, 110, and 111): This form is the most common one found, distributed in many of the Caribbean islands, in South America from eastern Venezuela to southern Brazil, in portions of Africa, and in much of southeast Asia and Indonesia.

LOCALITY UNKNOWN. Hb. Desvaux s.n. (P-2 sh.);  
Hb. Gasstrom s.n. (S); Hb. Swartz s.n. (S); Sukaburis-Njalindung,  
 Alausign Rjilfn, 2500 ft, 2-6-75, Kuntze s.n. (NY); 67, Beaufort For.  
 Dist. (Jesselton Interior Dist.), 5-4-1948, Cuadra A1354 (GH); Apr 1820,  
Plée s.n. (P).

#### S O U T H A M E R I C A

B R A Z I L. LOCALITY UNKNOWN: Posbozstesl [?] s.n. (W 359346);  
Milan s.n. (W-2 sh.); Lohüch s.n. (W); Pohl s.n. (W); Ventanat s.n.  
 (G-2 sh.); Hb. Zuccarini s.n. (M); 1783, Durand s.n. (G); 1815-17, Sello  
674 (BM); 1899, Blanchet s.n. (BM); 1845, Martius 229 (M-2 sh.); 1815,  
Freyreis s.n. (S); Widgren 478 (S); 1842, Hb. Guillimin s.n. (F);  
 Villa Nova, Martius s.n. (G-2 sh.); Rio Quintô, Nordbrasilien, Oct 1927,  
Luettelburg 21375 (M) and 21325 (M). SÃO PAULO: cult., Mun. de Matão,  
 at Fazenda Cambuhy, 4 km from Matão, 26 May 1964, Norris 278 (NY) and  
279 (NY); Conceição de Itanhaen, 24°11'S-46°47'W, 0-20 m, 4 Mar 1929,  
Smith 2050 (F,GH,S); road between São Vicente & Itaipu, 24°00'S-  
 46°24'W, 0-20 m, 25 Feb 1929, Smith 2003 (F,S); S. Vicente, 28 Mar 1929,  
Hoehne & Gehrt 23911 (GH,NY). RIO DE JANEIRO AND GUANABARA: Rio de  
 Janeiro, Anonymous s.n. (E); l.c., Bunbury s.n. (CGE); l.c., Gardner s.n.  
 (P); l.c., Hb. Miers s.n. (BM); l.c., Widgren s.n. (S); l.c., 1842,  
Widgren s.n. (S-2 sh.); l.c., Wilkes s.n. (GH,NY-2 sh.,US); l.c.,  
 1858, Weddell 388 (G); l.c., 1832, Riedel 131 (BM,E,GH,M,S-2 sh.,W);  
 l.c., Jard. Bot., Anonymous 173 (RB,S,U); Dist. Federal, Recreio dos  
 Bandierantes, 29 Oct 1938, Lutz & Pulle 1105 (BM,U); l.c., 1 Jan 1935,  
Lutz & Cochran 29271 (GH); Restinga de Jacarepaguá, Recreio dos  
 Bandeirantes, 16 Apr 1958, Liane et al. 3505 (RB); Restinga de Jacarepaguá,  
 13 Mar 1933, Mattos 198 (FLAS,RB); l.c., 12 Dec 1946, Rizzini s.n. (RB);

Jacarepaguá, 100 ft, 4 Sep 1921, Holway 1088 (GH); Rio Restinga de Jacaryraguá, 28 Feb 1932, Blade 223 (GH); Restinga da Tijuca, 4 Apr 1944, Machado 614 (RB); l.c., 27 Oct 1946, Machado s.n. (FLAS,RB); l.c., 1948, Machado s.n. (RB-2 sh.); Barra da Tijuca, 8 Mar 1964, Lems s.n. (NY-3 sh.); l.c., 4-2-1968, Sucre 2287 (FLAS,RB); l.c., 7 Feb 1973, Krapovickas, Cristobal, & Maroñah 23165 (SI); Restinga da Gaven, do Leblan de Tijuca, 24 Mar 1948, Machado 52 (RB-2' sh.); Restinga do Leblan, 1 May 1942, Machado s.n. (FLAS,RB); Praia de Labland, 2 Feb 1901, Hemmendorff 343 (S-2 sh.); campos de LeBlan, capital federal, 2-4-1894, Porto 31 (RB); Restinga de Itapeba, Dist. Fed., 23°00'13"S-42°20'49"W, 10 Dec 1950, Segadas & Vianna 3603 (US); matas do Parque da Cidade, 100 m, 18 Nov 1966, Sucre et al. 1221 (FLAS, RB); Ilha do Governada, 20 Jan 54, Pabst 10228 (M); Lemc. Ruste, 1910, Lutzelburg 340 (M); Baixada Fluminense, Estrada de Magé, 11-12-1947, Duarte 1027 (FLAS,RB); Cambuaba, Cicade de Meninas, 10-2-1944, Carcerelli 81 (FLAS,RB); C. Praia de Turijuba, Casaretto 1748 (G); Saposemba [?], 1886, Glaziou 8645 (G); Catumby, 7 Jan 1841, Gardner 5430 (BM,CGE). MINAS GERAIS: Rio Jequití, ca 20 km E of Diamantina, 790 m, 13 Mar 1970, Irwin et al. 27414 (GH,MO,NY,RB,UMO,US). BAHIA: Blanchet s.n. (G-2 sh.); 1830, Saltzmann 143 (G); 1831, Saltzmann s.n. (CGE,E,G,HAL); Saltzmann s.n. (G-2 sh.,HAL,MPU,P-frag.); 1839, Blanchet 34 (F-mixed); 1831, Blanchet 45 (G); Marais San Antonio prer Villa de Barra, 1840, Blanchet 3130 (BM-2 sh.,F,G-2 sh.,NY,W); Moritiba, Jan 1843, Blanchet s.n. (G); ad Tateropolin, Feb, Martius 2014 (M-2 sh.); Itapua, regias de dunas, Mar 1961, Athayde s.n. (FLAS,RB); Centro de Pesquisas do Cacau, PEPEC Ilheús, 13 Sep 1965, Belém 1783 (NY); Cruz de Casma, Apr 1835, Martius 211 (W). PERNAMBUCO: 1847, Foressell 181

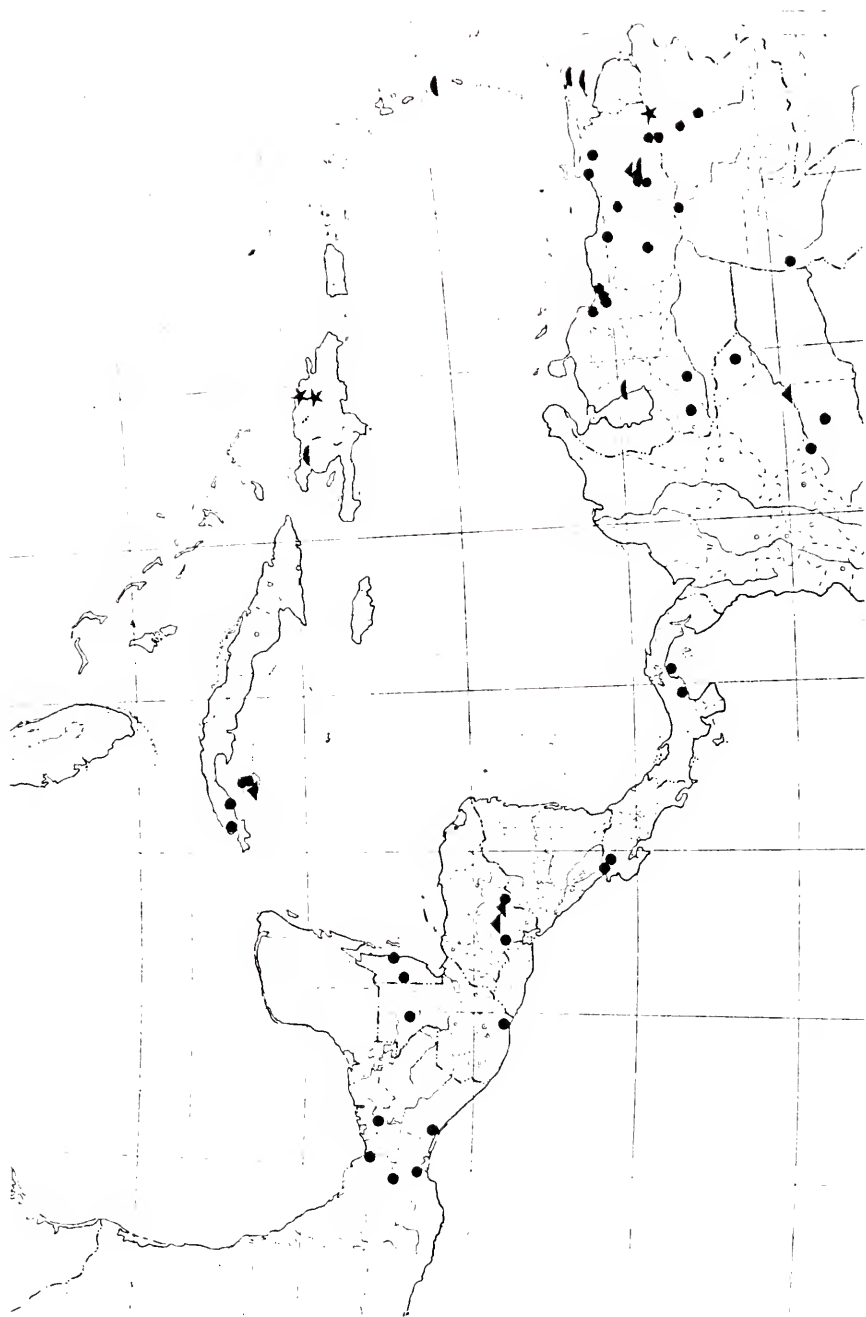
(S); 1842, Hb. Guillimin s.n. (F); Igarassu, Tabuleiro a margem estrada Porto Adiantado, 25 Jan 1959, Tavares 485 (US); Recife, cult. Dois Irmaas, Vasconcellos s.n. (RB). RIO GRANDE DO NORTE: Natal, margem da Lagoa do Jiqui, 17 Apr 1957, Tavares 457 (US). AMAPA: road to Amapa, 48 km, 10 Jul 1962, Pires & Cavalcante 52009 (NY,US) and 52034 (NY). RIO BRANCO: Lurumu, Mar 1910, Ule 7778 (U). PARÁ: vic. Santarém, Nov.-Mar, 1849-50, Spruce 264 (BM,CGE,E-2 sh.,F,G,GH,M,NY,US,W); l.c., Apr-Jul 1850, Spruce s.n. (K). AMAZONAS: cult. Rio Negro, flum. Curicuriary, 24 Dec 1931, Ducke s.n. (FLAS,S,U); Rio Negro, Yucabí, 13 Sep 1928, Tate 131 (NY); Rio Vaupés, Panuré, 15 Nov 1947, Pires 1025 (NY).

S U R I N A M. NICKERIE: Sipaliwini Savanna, Jan 1970, Oldenburger, Norde, & Schultz 1058 (U); l.c., Feb 1970, Oldenburger, Norde, & Schultz 1347 (U); l.c., 56°9'W-2°N, 4 Sep 1966, Donselaar 3679 (U); Kayers Airstrip, Zuid R. 45 km above confluence with Lucie R., 3°10'-20'N-56°29'-49'W, 270 m, 22 Sep 1963, Irwin et al. 55921 (F,GH,M,MICH,MO,NY-mixed,RB,U,UC,US,VEN).

G U Y A N A. Nov. 1836, Schomburgk 58 (BM,CGE,E-mixed,F-mixed,G-3 sh.,GH,W-2 sh.; non W 18407); Arachmere wau, 2 Dec 1957, Cook 234 (NY); Schomburgk s.n. (GH).

V E N E Z U E L A. ANZOATEGUI: Rio Tigre, en Cristovero, ESE de Santomé, 19 Dec 1940, Pittier 14589 (F,S,US,VEN). BOLÍVAR: Gran Sabana, between Kun & Uaduara-parú, Rio Kukenán, S of Mount Roraima, 1065-1220 m, 1 Oct 1944, Steyermark 59073 (F). ZULIA: Mene Grande, Pittier 10628, 31 Oct 1922 (NY), 8 Nov 1922 (G), and 1 Nov 1922 (GH,US).

Figure 110. Caribbean American distribution of two species of section Neurocarpum. C. guianensis var. guianensis f. guianensis (●), f. imperfecta (▲); C. laurifolia f. laurifolia (◐), f. glabrior (★).



NORTH AMERICA AND WEST INDIES

TRINIDAD. 1826, Sieber 187 (G-2 sh.,GH,W); savannas, Anderson 2568 (G); Erin Savanna, Jul 1942, Beard 64 (S); Oroponche road to St. Joseph, 11 Jul 1865, Preci [?] 2683 (NY).

MARTINIQUE. culta, 17 Apr 1860, Debeaux 42 (US).

PUERTO RICO. Vega Baja, 31 Mar 1922, Britton, Britton, & Brown 6758 (NY); Manati, 25 Nov 1913, Stevens 5270 (NY); near Lauturce, 19 Jan 1897, Heller & Heller 248 (F,NY).

HAITI. Massif du Nord, NE Organise, near R. Terre-Neuve, 600 m, 31 May 1926, Ekman 6213 (S).

UNITED STATES. FLORIDA: Alachua Co., Plant Introduction Garden, Gainesville, 20 Oct 1934, Ritchey s.n. (FLAS).

AFRICA

NIGERIA. EASTERN: Victoria Bot. Gardens, Cameroons, 2 Oct 1927, Fairchild 1165 (US).

ZAIRE (BELGIUM CONGO). EQUATEUR: Momboyo, 8-9-1935, Louis 74 (K); cult. Eala, Corbitier 1037 (K); Eala Bolomba, 330 m, 6 Jan 1944, Germain 1866 (BM,K,M); between Eala & Coquilhatville, Jul 1930, Lebrum 692 (BM,K). LEOPOLDVILLE: Terr. Kuta, Mongobele Route de la Plantation, Mar 1951, Flamiqui 10281 (BM,K). ORIENTALE: Yangambi, 1935, Louis 329 (K); l.c., Jardin Agrostologie, 13 Dec 1960, Menavanza F. 109 (K).

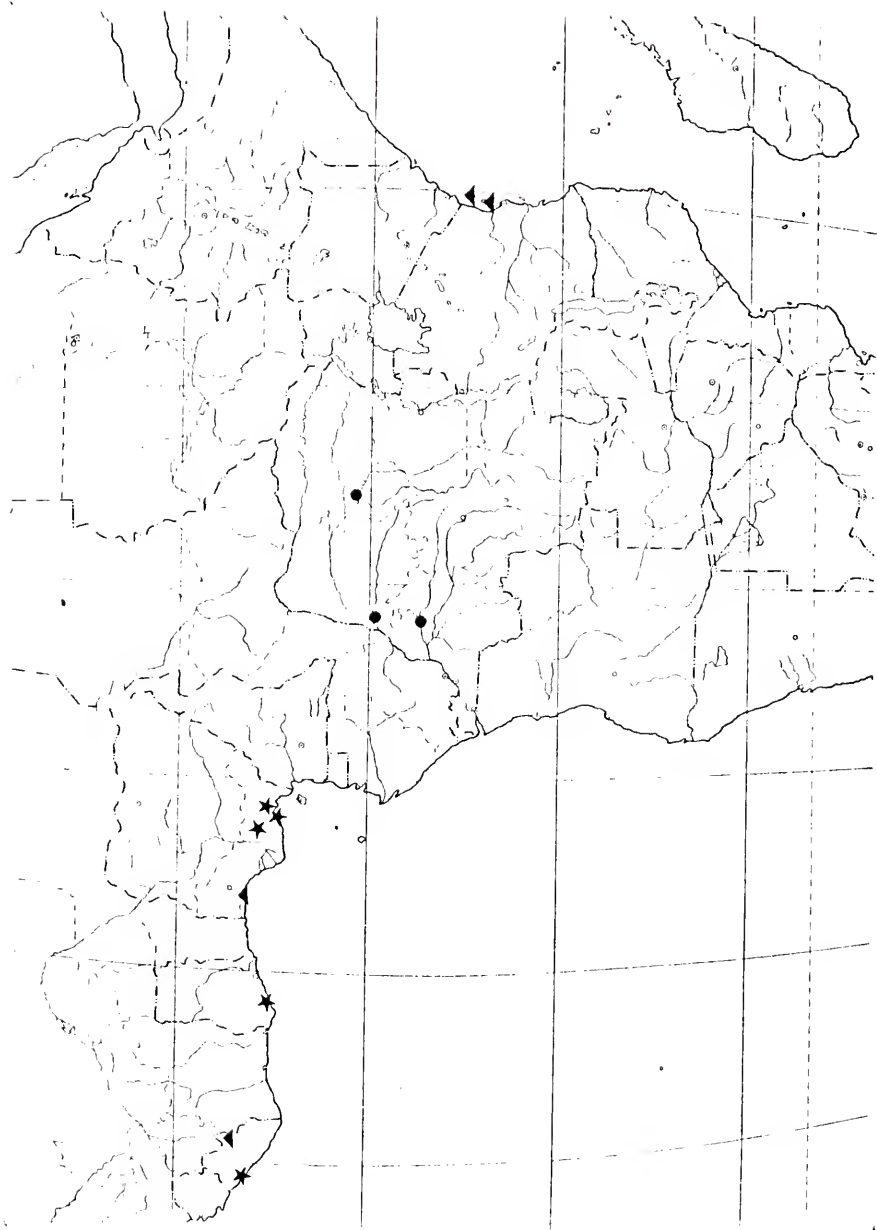
ASIA AND INDONESIA

INDIA. WEST BENGAL: Calcutta, 1830, CBD s.n. (E).

SRI LANKA (CEYLON). Batapola, 15 Sep 1931, Simpson 8619 (BM); Ratnapura Dist., 1 mi E of Kalawana, 28 Jun 1972, Maxwell, Hepper, & Fernando 972 (K,M0); from Ratnapura on A4, culvert 57/6,

Figure 111. African distribution of two species of section  
Neurocarpum. Clitoria laurifolia f. laurifolia (●);  
C. falcata var. falcata f. falcata (★), var. glabrescens  
(▲).





30 Jun 1972, Maxwell & Fernando 984 (MO); Mt. Lavinia, SE corner of Columbo Airport, 2 Aug 1972, Maxwell 1032 (MO); Tarakuliya, S of Negombo, 23 Mar 68, Comanor 1149 (K,US).

C H I N A. FUKIEN: Chung 7053 (A).

T H A I L A N D (SIAM). Pen Narathinat, 10 m, 15 Jun 1970, Smitinand 10984 (E).

V I E T N A M. Cochinchina, Pierre s.n. (A).

M A L A Y S I A. HDC s.n. (CGE). SELANGOR: Salak Laut Rd, 7 Jun 1921, Seward s.n. (K). MALACCA: Jul 1895, Mayer s.n. (W); environs de Malacca, 1840, Delessert s.n. (G); from no. 10 mi Sawbegabatu, 8 Sep 1890, Hervey s.n. (BM); Malacca, Griffith s.n. (BM,CGE); l.c., Griffith 18 (CGE); l.c., Griffith 1845 (GH). SINGAPORE: Singapore, Griffith 1724 (GH,K); l.c., 1886, Beck s.n. (W-2 sh.); l.c., 1909, hb. Ridley, Tucin s.n. (BM); l.c., Oct 1875, Kuntz 6060 (NY); l.c., Schomburgk 85 (NY); l.c., Thompson s.n. (GH); l.c., 60 ft, 14 May 1929, Clemens & Clemens 22546 (A,NY-2 sh.); l.c., Aug 1899, Dihm s.n. (M); l.c., Oct 1861, Anderson 56 (BM); l.c., near Royal Singapore Golf Course along edge MacRitchie Reservoir, 1°21'N-103°49'E, 18 Nov 1961, Abbe & Abbe 10159 (A); N of 10 mi Jurong Road, 24 Feb 51, Sinclair s.n. (E); Chan-chu-kan, 1894, Langlassé 176 (G-2 sh.); Sungai Tukongestate, Johore, 15 Jul 1931, Spare 924 (K,NY).

R I O U W A R C H I P E L A G O. BINTAN ISLAND: L Paelei, 10 m 20 Jun 19, Bunneymeyer 6036 (K).

S U M A T R A. Asahan Bandar Poeloeh, E Coast, 4 Apr 26, Yates 2034 (NY,UC); Aer Kandis (formerly Radja Mas), near Rantan Parapat, Bila, 28 May-26 Jun 1932, Toroos 2645 (NY); Rantan Parapat, Bila, 18-23 May 1932, Toroos 2209 (NY); l.c., 28 Mar-10 May 1932, Toroos 2022 (NY,US-2 sh.).

J A V A. Ex hb. Lugduno-Batava s.n. (GH,K,S,U,W); Zollinger 784 (BM,G); 17 Nov 55, Zollinger 748 (BM-2 sh.,G-2 sh.,W); Buitenzorg, Apr 1921, Arrhenius s.n. (S); l.c., 250 m, 18 Apr 1920, Brink 233 (U); l.c., 150 m 4 Dec 1904, Hochreutiner 2551 (G); l.c., 1886-87, Warburg 2213 (NY); Mt Goenoeng Pantjar a de Buitenzong, 300 m, 17 Sep 1904, Hochreutiner 1844 (G); Batavia, Monte Pantjar, 27 Dec 1893, Schiffner 2038 (K); Heester Cornelis, 25 ft, 19 Jul 03, Backer 21312 (U,UC); Kuripan, 300 ft, 15 May 1875, Kuntze 4342 (NY); Lukaburin-Ngalindung, Lansign Pija [?], 2500 ft, 2 Jun 1875, Kuntze 5317 (NY); Tjinera bei Kuningen, 29 Dec 1960, Neubauer 257 (W); Preanger Reg Tjiratjap Djamprang Krelan, 25-50 ft, 21 Nov 14, Backer 17376 (UC).

B O R N E O. LOCALITY UNKNOWN: Kerding, Feb 1893, Havilana 2886 (K); Mile 67 Beaufort For. Dist., 5-4-1948, Cuadra A1345 (A). SARAWAK: Anonymous, Sarawak Mus. 703 (A) and 1038 (A); Kuching, Astana grounds, 26 Dec 1959, Williams WIL-2 (K); Santubong, 23 Feb 1954, Brooke 8107 (F,G,US); Sematon, 50 ft, 27 Sep 55, Purseglove 4854 (K).

P O N G K O R I S L A N D. Pasir ketapang, 8-7-55, Burkill & Shah 225B (K).

52b. Clitoria laurifolia Poir. f. glabrior (Benth.) Fantz,  
comb. nov.

Clitoria cajanifolia (Presl) Benth. f. glabrior Benth. in  
Mart. Fl Bras. 15(1): 121. 1862.

Neurocarpum blanchetianum Moricand, nom. in sched.

Leaflets oblong to elliptic-oblong, 4-10 (13) cm long, 1.5-3 cm wide. Petiole 2-4 (5) mm; rachis 4-9 mm. Inflorescences solitary,

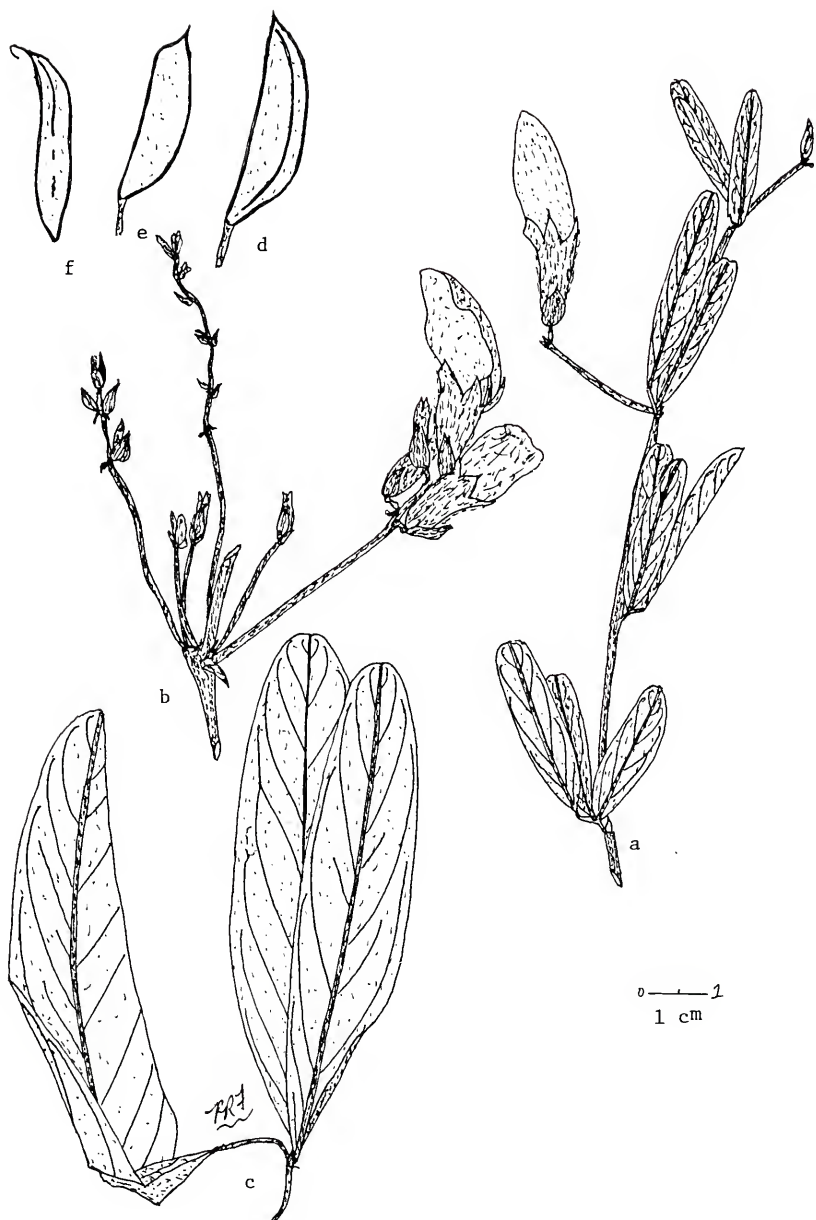
occasionally paired per node. Legume ecostate or with an imperfectly formed costa on each valve, extending ca one-fifth to three-fifth of the length of the valve, costa becoming impressed toward the base of the legume.

Bentham's form is easily recognized by the absence of the medial nerve on the legume, or by the legume having an imperfectly formed costa.

TYPE COLLECTION: BRAZIL. PERNAMBUCO: Nov 1837, Gardner 969 (LECTOTYPE: S. Isolectotypes: BM, CGE, E, G-2 sh., NY-2 sh., S, W).

Bentham (1862) published the name for his form under the synonym of C. cajanifolia, described as "Forma glabrior, legumine saepius ecostato." Bentham cited Poiret's name, Clitoria laurifolia, and Desvaux's name, Neurocarpum laurifolium, in synonymy under the form. The types for these two names (Ledru 71, Hb. Poiret - P! G! and Hb. Desvaux - P 59!) both have costate fruits, a condition which is in disagreement with Bentham's description of the form. Bentham did not designate a type collection for his form name, but cited five collections for the species, without designating which collections belong to the typical form and which belong to his f. glabrior. Velloso s.n. was not examined by the author of the present study, but it is presumed that the specimen agrees with Velloso's Lotus fluminensis, which has costate fruits. Specimens of Blanchet 34 and 3130 are mixed collections representing both the typical form with costate fruits, and f. glabrior with imperfect costas on the fruits. Gardner 1351 was not examined by the author of the present study. Gardner 969 is representative of the form glabrior and thus is selected as the more probable type collection. Of the several specimens examined, there is no indication which specimen(s) Bentham may have examined. The Stockholm

Figure 112. Clitoria laurifolia. f. parvifolia: (a) habit, x 1.  
f. fasciculata: (b) node with inflorescences, x 1.  
f. petiolata: (c) leaf with petiole and rachis, x 1.  
f. laurifolia: (d) costate legume, x 1. f. glabrior:  
(e) ecostate legume, x 1; (f) legume with imperfectly  
formed costa, x 1. (Williams 12940, VEN 4052: a.  
Ferraz & Lima 47, RB 77777: b. Perrottet s.n.,  
G569-70: c. Swartz s.n., S: d. Gardner 969, E-22: f.  
Drouet 2663, F 948710: e.)



specimen is designated as the lectotype because it has the best representative fruits containing both an imperfect costate legume and two ecostate legumes.

Although Bentham described only the ecostate condition, legumes on a single individual may bear ecostate fruits as well as those fruits which exhibit varying degrees of imperfectly formed costas. The collective set of specimens of Gardner 969 reflects this variability.

DISTRIBUTION (Figures 85 and 110): This form occurs sporadically within the range of the species in the neotropics, and is nearly absent in specimens from the paleotropics.

LOCALITY UNKNOWN. Hb. Riedlé s.n. (MPU).

S O U T H A M E R I C A

B R A Z I L. LOCALITY UNKNOWN: Loris asperis ad Coralfalzas, Feb 1818, Pohl 335 (NY,W). RIO DE JANEIRO AND GUANABARRA: Rio de Janeiro, 1851, Anderson s.n. (S); l.c., Nov 1912, McLean 34 (BM); l.c., Horto Florestal, Porto 900 (RB); Jacarepagua, 100 ft, 16 Nov 1921, Holway 1314 (NY); km 29 Rio Petropolis "Camboaba," 20 Oct 1938, Alston & Lutz 90 (BM). BAHIA: 1842, Glocker 171 (BM,NY,S); Apr 1831, Lhotsky s.n. (G,PR); Blanchet s.n. (G-Hb. Moricand); 1834, Blanchet 1181 (G-2 sh.); 1839, Blanchet 34 (BM,F-mixed,G); Muritiba, 1842, Blanchet s.n. (G); Ondina, 7 Jun 54, Espinosa 888 (RB); Ilheus, 1859-60, Wawra & Maly 276 (W); 1859-60, Wawra & Maly 580 (W); montibus ad M. Sanct., Mar, Martius s.n. (M); 18 Jan 1887, Paulay s.n. (NY,W); Apr 1831, Lhotsky s.n. (G,PR). PERNAMBUCO: roadside near Euzeusilliada, 1887, Ridley, Lea, & Ramage s.n. (BM). PARAIBA: Baia da Eraicao, Goelho de Goray [?] 2282 (NY,UC,US). CEARÁ: Villa do Crato, Nov 1838, Gardner 1551 (BM) and Jan 1839 (B,GH); E end of Avenida Heraclito, Graca, Fortaleza,

4 Oct 1935, Drouet 2555 (F,GH,MO,NY,MICH,S,UM0): Barra do Ceará, mun. de Fortaleza, 2 Nov 1935, Drouet 2663 (F,GH,MICH). PARÁ: Estrada de Rodagem para a Vigia, campina do Pohla, 16 May 1952, Froes 27870 (NY). AMAZONAS: campo Aberto, Camunde, Rio Negro, 27 Apr 1948, Black 48-2403 (NY,U-2 sh.,VEN).

V E N E Z U E L A. DELTA AMACURO: Las Ciohas, Apr 54, Gines 5205 (US). BOLIVAR: Pto. Ordaz-San Felix, Apr 1964, Aristeguieta 5336 (VEN). APURE: Payarita, entre San Fernando & Achaguas, 13 Jan 1972, Ramía & Monte 4758 (VEN); Betel, 10 May 1940, Chardon 64 (US,VEN).

#### W E S T I N D I E S

P U E R T O R I C O. 4 Sep 1938, Sargent 579 (US); Graircés 124 (P); 1899, Heller & Heller 1319 (F,NY); Hb. Ventenat s.n. (G-2 sh.); Hb. Desvaux s.n. (P-58); Algonoba, 26 Jul 1914, Stevenson 2122 (NY,US); near Laguna Tortuquero along rt 687, 17 Jan 1968, Howard & Nevling 17030 (A,U); l.c., 7 Jul 1963, Wagner 287 (U); l.c., 2 Aug 1964, Wagner 592 (BM,S,U); from Manati to Vega Baja, 20 Jul 1901, Underwood & Griggs 958 (NY,US); Durado, 19 May 1887, Sinten 6848 (BM,F,G-2 sh., GH,M,MO,NY,US,W); l.c., 20-22 Mar 1922, Britton, Britton, & Brown 6652 (F,NY). VERDE ISLE: San Juan, 0 m, 20 Aug 1963, MacKee 10583 (P).

D O M I N I C A N R E P U B L I C (SANTO DOMINGO): Hotel Nemtaria, La Vega, 500 m, 9 Apr 1964, Jimenez 4948 (NY); Cordilla Septentrional, Martanzas, Sabanna Carrasca, 9 Aug 1930, Ekman 15889 (S); Noncion, La Mesta, 600 m, 24 Jun 1929, Ekman 13023 (S).

#### I N D O N E S I A

J A V A. Mar 1891, Barbèy s.n. (G-2 sh.).



52c. Clitoria laurifolia Poir. f. fasciculata Fantz, f. nov.

Leaflets oblong to elliptic-oblong, 4-7 cm long, 1.5-3 cm wide. Petioles 2-4 mm; rachis 4-9 mm. Inflorescences fascicled, 2-7 peduncles per node, each several-flowered bearing chasmogamous flowers. Legume costate.

This form is easily recognized by its fascicled arrangement of peduncles at the nodes, and each peduncle bearing several chasmogamous flowers which are somewhat separated.

TYPE COLLECTION: BRAZIL. BAHÍA: Flores roscas, Vila Ziza, Brotas, Salvador, 6-12-51, Ferraz & Lima 47 (HOLOTYPE: RB 77777, mounted on two sheets).

This collection is mounted upon two sheets placed within a common folder. Sheet one, which contains the data, has a portion of the stem and clearly exhibits the fascicled arrangement of the inflorescences. Sheet two has a stem with only one inflorescence bearing cleistogamous flowers.

DISTRIBUTION (Figure 85): This form is known only from the type locality in Bahía, Brazil.

52d. Clitoria laurifolia Poir. f. parvifolia (Pittier) Fantz, comb. nov.

Clitoria parvifolia Pittier, Bol. Tecn. 5: 49. 1944.

Leaflets oblong-linear, small, 2.5-3.5 cm long, 0.7-1.3 cm wide. Petioles nearly lacking, 1-1.5 mm long; rachis 7-13 mm. Inflorescences solitary. Legume unknown.

This form is easily recognized by the small, linear leaflets.

TYPE COLLECTION: VENEZUELA. BOLÍVAR: Herbacea de 30 cm o mas de alto; flores azul palilo, sabanna, El Palmar, 120 m, 30 Apr 1940, Ll. Williams 12940 (LECTOTYPE: VEN 4052).

Pittier did not cite any collection, but did cite the locality data as "Concoida solamente de las sabanas de El Palmar, 120 m, en el Estado Bolívar." Williams 12940 agrees with the published description and locality data, and bears the data "Clitoria parvifolia Pitt. sp. n., tipo" on the label. As the probable type for the basionym parvifolia, Williams 12940 is designated as the lectotype.

DISTRIBUTION (Figure 85): This form is known only from the type locality in Bolívar, Venezuela.

52e. Clitoria laurifolia Poir. f. petiolata Fantz, f. nov.

Leaflets oblong to elliptic-oblong, 4-10 cm long, 1.5-3.5 cm wide. Petiole 5-11 mm; rachis 7-13 mm. Inflorescences solitary, flowers paired. Legume with prominent costa on valves extending nearly the length of the valves.

This form is distinguished by the elongated petioles which are commonly up to 1 cm long, twice as long as the petioles of the typical form.

TYPE COLLECTION: FRENCH GUYANA. 1820, Perrottet s.n. (HOLOTYPE: G 569 and 570).

The type collection is mounted on two sheets within a common folder; sheet one contains a stem mounted on the herbarium sheet with the characteristic longer petioles, whereas the second sheet contains only a packet of loose material.

DISTRIBUTION (Figure 85): This form is known only from French Guyana.

F R E N C H G U Y A N A. Hb. Desvaux s.n. (P-59, plant mounted on the right); Cayenne, Van Rohr s.n. (BM); l.c., hb. Aublet s.n. (W 217013).

53. Clitoria guianensis (Aubl.) Benth., Journ. Linn. Soc. 2: 40. 1858.

Crotalaria guianensis Aubl., Hist. Pl. Fr. Guian. 761, t. 305. 1775.

Crotalaria longifolia Lam., Ency. Meth. Bot. 2: 201. 1786.

Neurocarpum angustifolium Kunth, Mimos 218, t. 60. 1824.

Rhombifolium canescens Rich. ex DC., Prod. 2: 236. 1825; nom. illeg.

Neurocarpum longifolium Mart. ex Benth., Ann. Wein. Mus. Natur. 2: 116. 1837.

Neurocarpum frigidulum Mart. ex Benth., Ann. Wein. Mus. Natur. 2: 116. 1837.

Clitoria guyanensis Benth. in Mart. & Eichler Flor. Bras. 15(1): 121. 1862.

Ternatea guianensis (Aubl.) Kuntze, Riv. Gen. Pl. 1: 210. 1891.

Clitoria subsessilis Rose, Contr. Nat. Herb. 5: 169. 1899.

Clitoria chapadensis Malme, Ark. Bot. Stock. 23: 82. 1931.

Neurocarpum campestre Mart., nom. in sched.

Subshrub to perennial suffrutescent herb, 10-60 cm tall. Stems borne from apex of xylopodium or from stolons, erect to ascending,

unbranched, becoming weakly flexuous above, fire tolerant (often charred, intact lower stems up to 20 cm present on collected material), lignose to slightly lignose above, longitudinally striated, often purplish-tinged above, internodes straight to weakly arcuate, 2-12 cm long, juvenile stems densely pubescent, trichomes appressed to spreading, 1 mm long, and covering the inconspicuous, uncinata trichomes, stems soon becoming glabrate. Xylopodium infrequently collected, subterranean, horizontal, lignose, proximal portion thick, to 5-9 cm long, 4-10 mm thick, apex knobby and bearing 1-4 aerial stems, lower portion slender, 1-5 mm thick, to 2 m long, penetrating deeper into substrate, sometimes bearing slender, 1-2 mm thick, lateral branches to 20 cm long, pubescence of uncinata trichomes, becoming deciduous with age. Stolons horizontal, subterranean (?), longitudinally striated, yellowish-tinged, uncinata-pubescent, leafless, occasionally bearing dark, deltoid stipules of 1-2 mm in length, bearing infrequently aerial stems from the nodes or apex. Leaves 3-foliate, occasionally bearing 1-foliate leaves at lower nodes, rarely bearing only 1-foliate leaves, subcoriaceous; trifoliate leaves subsessile, elongate, oblong-lanceolate to oblong-linear, rarely broadened, oblong-elliptic to oblong-obovate, apex acute to obtuse, mucronate, base cuneate, margins sometimes slightly wavy on elongated leaflets, midrib nearly impressed above, primary nerves of 6-9 pair, occasionally to 12 pairs on very elongated leaflets, nerves widely spaced, arcuate near base and ascending somewhat parallel with margins, upper surface green to dark green, shiny (becoming dull with age), uncinata-pubescent, lower surface pale green, glaucescent, more or less pilose on the prominent, yellowish nerves, to glabrate, lamina of elongated leaflets 6-15 (20) cm long, 0.8-2.5 (3) cm wide, lamina of

broadened leaflets 5-9 cm long, 2.5-4 cm wide; unifoliate leaves similar to trifoliate leaflet, broader, sessile. Petioles 0.1-1.0 (1.5) cm long, longitudinally striated, uncinat-pubescent and bearing a few 1 mm long trichomes; rachis subequal to slightly longer than the petiole, 0.2-1.0 (1.6) cm long. Petiolules subterete, dark, 1.5-3 mm long. Stipules ovate-lanceolate to lanceolate, short-acuminate, 5-10 (12) mm long, 2-4 (5) mm wide, pubescence uncinat, slightly pilose, ciliate; stipels linear, 2-10 mm long, 0.3-1 mm wide, pubescence uncinat and more or less pilose-ciliate, terminal stipel usually shorter than the lateral stipels. Inflorescence axillary, racemose, typically biflowered or occasionally 4-6 flowered, bearing chasmogamous or cleistogamous flowers, rarely chasmocleistogamous. CHASMOGAMOUS FLOWERS showy, blue to lavender, vexillum with a white base and prominent, purplish-pink veins, flowers large, 5.5-7 (7.5) cm long. Peduncles weakly arcuate near base, straight above, 0.5-6 (8) cm long, longitudinally striate, bearing typically two flowers from its expanded apex. Pedicels 5-9 mm. Bracts 2-4, rarely 6; inner pair caducous, 2 mm long, 0.2-0.3 mm wide; middle pair persistent, ovate, striate, acute, concave around pedicels, 4-9 mm long, 1.5-4 mm wide, pubescence of uncinat and sparse, 1 mm long trichomes; outer pair deciduous, ovate, acute, between the pedicels, 3-6 mm long, 1-1.5 mm wide. Bracteoles oblong-lanceolate to lanceolate, acute to short-acuminate, 8-14 (15) mm long, 2-4 (5) mm wide, inserted 1 mm below the calyx, occasionally becoming 2-3 mm below calyx base during fruiting, pubescence of uncinat and 1 mm trichomes, pilose-ciliate. Calyx pubescence uncinat and sparsely to moderately pilose, trichomes to 2 mm long, ascending and spreading, tube 10-nerved, five nerves extending to lobe apex, five nerves extending to sinus, then

dichotomizing with a branch entering each adjacent lobe, tube 16-22 mm long, 4-7 mm wide at the base expanding to 8-13 mm wide at the throat, lobes broad, prominently 3-nerved, acuminate, sparsely ciliolate, (7) 9-15 mm long, 4-6 mm wide, ventral lobe 10-16 mm x 2 mm. Vexillum sparsely uncinately pubescent, 3.5-5 cm wide, claw 7-11 mm. Alae with white base and blue to blade, extending well beyond the carina by 7-12 mm, blade 21-28 mm long, (5) 6-9 mm wide, claw 14-23 mm. Carina falcate, blade 11-15 mm long, 5-7 mm wide, claw 22-31 mm. Staminal tube 31-40 mm, free filaments 2-5 mm; anthers 1.5-2 mm long, 0.8-1 mm wide. Gynophore 6-8 mm, dark, densely uncinately pubescent; ovary linear, costate, 7-10 mm long, 1 mm wide, densely uncinately pubescent; style 24-30 mm, geniculate 6-9 mm from the distal end, beard short; stigma dilated, 0.8-1 mm in diameter. Legume stipitate, costate, green, 3.5-5.5 cm long, rarely to 7 cm, 6-11 mm wide, valves convex, striolate, stipe enclosed within the calyx tube, 11-14 mm; beak to 1 cm; costa prominent, extending nearly the entire length of the valves, or infrequently imperfectly formed, extending one-quarter to nearly the length of the valves, weakly raised, becoming subimpressed toward the base, nerve 3-4 mm from the margin; dehiscence causing valves to twist ca one-quarter to one-half of a turn. Seeds subglobular, reddish brown to black, viscid, slightly longer than wide, 3.5-5 mm long, 3-5 mm wide, 3-4 mm thick; 5-10 seeds per pod. CLEISTOGAMOUS FLOWERS minute, inconspicuous. Peduncles short, 0.2-1 cm long, hidden typically amongst the bracts and stipules. Pedicels 1-4 mm. Bracts 2-4, rarely 6; inner pair caducous, 2-3 mm long, 1 mm wide; middle pair persistent, ovate-lanceolate, 3-7 mm long, 1-2 mm wide; outer pair 3 mm long, 1 mm wide. Bracteoles lanceolate, acute, 3-7 mm long, 1-1.5 mm wide, inserted 0.5-1 mm below

the calyx, pubescence uncinata and pilose. Petals typically lacking, rarely rudimentary petals of 1 mm long, whitish, translucent. Calyx tube typically 4-8 mm long (rarely 9-12 mm), 1-2 mm wide at the base expanding to 2-3 mm at the throat, lobes ovate, 3-4 mm. Staminal tube ca 0.5 mm long, free filaments 2-4 mm; anthers ovate, 0.7-1 mm long, 0.5-0.7 mm wide. Gynophore 2-3 mm, densely uncinata-pubescent; ovary 4-5 mm long, costate, densely uncinata-pubescent; style 5-6 mm long, bent abruptly backwards at the base; stigma ca 0.5 mm dia. Legume similar to legume from chasmogamous flowers, slightly shorter, 2.5-5 cm long; stipe exerted beyond tube or enclosed, 6-20 mm long. Seeds similar to those of legumes from chasmogamous flowers, 6-14 per pod. Figure 113 and 115.

Aublet's Clitoria is characterized as a subshrub with subsessile, 3-foliate leaves with narrow, elongated leaflets, axillary peduncles bearing two large, blue to lavender flowers or costate legumes, and commonly producing cleistogamous flowers.

PHENOLOGY: This species produces flowers and fruits nearly all year as collections of flowers and fruits have been made in every month. Chasmogamous flowers are typically produced from late August through June, with flowers rarely produced in July and early August. Legumes from chasmogamous flowers are uncommon, typically collected from October through January, with occasional collections made in July through October. Sterile specimens are commonly made from July through September. Collections of this species made from July to mid-August are rare.

TYPE COLLECTION: FRENCH GUYANA. Pratis Courour [=Kourour savanna], Aublet s.n. (TYPE: P-not seen. Isotype: BM!).

Figure 113. *Clitoria guianensis* - I. Var. *guianensis* f. *guianensis*: (a) habit, x 1; (c) older leaflet, x 1; (d) flower, x 1; (e) calyx, x 1; (f) vexillum, x 1; (g) ala and carina, x 1; (h) androecium, x 1; (i) gynoecium, x 1; (k-l) legumes, x 1; (p) three views of seed, x 1. Var. *guianensis* f. *unifoliata*: (b) portion of stem with attached leaf, x 1. Var. *guianensis* f. *macrofructa*: (j) chasmogamous flowers with legumes, x 1. Var. *guianensis* f. *imperfecta*: (m-o) legumes, x 1. (Brade 5643, BM: a. Lofgren 181, RB 3699: d-i. Irwin et al. 16565, NY: c,k. Irwin 2384, NY: l,p. Dusen 11604, GH: b. Lutzburg 3018, M-54: j. Pittier 14589a, VEN: m-o.)





The author of the present study has not seen the type for this species, although he has examined a duplicate of the type collection now deposited in the Herbarium of the British Museum. He has also examined the illustration provided with the original description published by Aublet. Aublet's species historically has been transferred to several of the genera within the Clitoria complex. Sometimes, botanists had misinterpreted Aublet's description and illustration when identifying specimens and transferring the name. As a result, Aublet's type is sometimes confused with another species, C. laurifolia (e.g., refer to discussion of Desvaux under the subgenus, p. 632), and is distinguished by the smaller flowers, shorter bracteoles and calyx, the canescent lower surface of the leaflets, and usually duller appearance of the leaves. Clitoria laurifolia is compared with C. guianensis in Table 14. The type of C. guianensis does not agree with the type of C. laurifolia (Ledru 71, P!G!). Aublet's description regarding the size of the stipules and bracteoles, as well as the leaflet pubescence, clearly indicate that C. guianensis is distinct.

VERNACULAR NAMES: CUBA (Pinar del Rio): Papo de la Reina, Blain 29. BELIZE: Mauve Bell, Gentle 4088. VENEZUELA: Generala, Aristequieta 1633 (Barinas), Pittier 15017 (Anzoategui), and Williams 12087 and 11931 (Sucre). GUYANA: Quarapar-tabai (Wapisiana), Smith 2413. BRAZIL: Espelina Falsa, Brade 5643 (São Paulo); Catuaba, Barreto 42 and Assis 5416 (Minas Gerais).

ECONOMIC IMPORTANCE: This species is occasionally cultivated on a local basis. Williams, Assis, and Moreira 5416 reported that catuaba is put in cachaca [a liquored drink] "to make a man out of you." They described the effects as "Potencia."

NOTES: Clitoria guianensis is closely related to C. epetiolata which is distinguished by the sessile, digitate, 3-foliate leaves. Clitoria guianensis has subsessile, pinnate, 3-foliate leaves as well as occasionally producing 1-foliate leaves at lower nodes.

From the large number of collections of this species, specimens collected bearing legumes from chasmogamous flowers are rare, represented in only eight collections. Two collections are from Venezuela (Bolívar), two from Brazil (Bahia and Minas Gerais), and one each from Guyana, Panama, Guatemala, and Belize. Collections with chasmogamous flowers are well represented throughout the range of the species. Cleistogamous flowers and the legumes it produces are very common in collections from South America except for Surinam and Guyana where collections lack any cleistogamous flowers, and in Venezuela where cleistogamous flowers are rarely represented. Cleistogamous flowers and its associated legumes are rarely represented in Central American collections, but are very common in Cuba specimens. Whether these observations represent any biological distribution of the pollinators, or the collecting habits of the field botanists, is not yet determined. This type of pattern is not represented in other species of Clitoria.

Leaflets in this species are variable in their size (particularly in the length), the amount of pubescence below, and the glossiness of the upper leaf surface. Stipules and bracteoles are also variable in length. Specimens exhibiting variations of both extremes, as well as intermediates, can be found throughout the range. Croat (1972) described a variety (representing the Central American and West Indies members) based upon the leaflet width and the glossiness of the upper leaf surface. His characters of segregation break down. The Central

American and Cuba representatives agree with the type from French Guyana, and thus represent the typical variety.

Variation within the species is somewhat consistent throughout the range of the species, except for central Brazil. In this area, there are a number of individuals which are distinct from the typical members of the species, and treated at lower taxonomic levels. The only exception occurs in the imperfectly formed costa, which occurs sporadically throughout the range of the species. (Imperfect costas are also found in C. laurifolia and C. falcata.)

DISTRIBUTION (Figures 110 and 114): Clitoria guianensis is common in the neotropics from Brazil to southern Mexico, and in western Cuba. It is found in savannas, rocky cerrado, and pine or pine-oak forests, usually in dry, sandy soil, at elevations of 100-1200 m.

KEY TO VARIETIES AND FORMS: Flowering and fruiting structures associated only the cleistogamous flowers are noted. Lack of any designation indicates those structures are associated with chasmogamous flowers, or with both flower types.

1. Leaflets elongated, narrow, linear to lanceolate, ratio of length/width is 3-6:1, leaflets 1-2.5 (3) cm wide, 7-15 (20) cm long; stipules short and narrow, 5-9 mm long, 2-4 mm wide; petiole long, 3-10 (rarely 20) mm; rachis long, 2-11 (15) mm
2. Calyx tube of cleistogamous flowers 4-8 mm long; stipes (6) 9-14 mm; petiole 3-10 (14) mm; rachis 2-11 (14) mm . . . . .  
 . . . . . 53a. var. guianensis
3. Leaves predominantly 3-foliate, 1-foliate leaves absent or occasionally borne at lower nodes.

4. Legumes costate, costa prominently raised, extending nearly the entire length of the valve; common.
  5. Legumes of chasmogamous flowers short at maturity, 3.5-5.3 cm long (Brazil to S. Mexico, Cuba) . . . . . 53aa. f. guianensis
  5. Legumes of chasmogamous flowers elongate, 6-7 cm long (Brazil). . . . . 53ab. f. macrofructa
  4. Legumes ecostate or with costa imperfectly formed, weakly raised, extending only one-quarter of the length of the valve to occasionally nearly the entire length (often a mixture of costa lengths on the same plant); uncommon (Brazil to S. Mexico, Cuba) . . . . . 53ac. f. imperfecta
  3. Leaves all 1-foliate on stem (Brazil). 53ad. f. unifoliata
  2. Calyx tube of cleistogamous flower elongate, 9-12 mm long; stipes 14-20 mm; petioles of larger leaves 10-20 mm; rachis 8-17 mm (Brazil). . . . . 53b. var. macrocleistogama
  1. Leaflets short, broadened, oblong-elliptic to oblong-obovate, ratio of length/width is 2-2.5:1, leaflets (2) 2.5-4 cm wide, 5.5-9 cm long; stipules long and broad, 7-12 mm long, 4-5 mm broad; petiole short, 3-6 mm; rachis 2-5 mm (Brazil) . 53c. var. chapadensis
- 53a. Clitoria guianensis (Aubl.) Benth. var. guianensis  
Crotalaria guianensis Aubl., Hist. Pl. Fr. Guian. 761,  
 t. 305. 1775.
- Crotalaria longifolia Lam., Encyc. Meth. Bot. 2: 201. 1824.
- Neurocarpum angustifolia Kunth, Mimos 218, t. 60. 1824.

Rhombifolium canescens Rich. ex DC., Prod. 2: 236. 1825;  
nom. illeg.

Neurocarpum longifolium Mart. ex Benth., Ann. Wein. Mus.  
Natur. 2: 116. 1837.

Neurocarpum frigidulum Mart. ex Benth., Ann. Wein. Mus.  
Natur. 2: 116. 1837.

Clitoria guyanensis Benth. in Mart. & Eichler Flor Bras.  
15(1): 121. 1862.

Ternatea guianensis (Aubl.) Kuntze, Riv. Gen. Pl. 1: 210.  
1891.

Clitoria subsessilis Rose, Contr. Nat. Herb. 5: 169. 1899.

Clitoria guianensis (Aubl.) Benth. var. subsessilis (Rose)  
Croat, Phytologia 29(2): 131. 1974.

Leaves 3-foliolate and occasionally 1-foliolate; leaflets elongated, linear to lanceolate, 7-20 cm long, 1-2.5 (3) cm wide. Petioles 3-10 (20) mm; rachis 2-11 (15) mm. Stipules 5-9 mm long, 2-4 mm wide. Calyx tube of cleistogamous flowers 4-8 mm long. Legumes costate or occasionally weakly costate to ecostate; stipes (6) 9-14 mm. Figure 113.

DISTRIBUTION (Figures 110 and 114): This is the most common variety collected, distributed from Brazil to southern Mexico and in western Cuba.

53aa. Clitoria guianensis (Aubl.) Benth. var. guianensis f.  
guianensis.

Leaves 3-foliolate and occasionally 1-foliolate. Legumes 3.5-5.3 cm long, costate, the medial nerve prominently raised and extending nearly the entire length of the valves. Figure 113.

DISTRIBUTION (Figures 110 and 114): The typical form is the most common form collected, occurring from Brazil to southern Mexico, and Cuba.

L O C A L I T Y U N K N O W N. Hb. DeCandolle s.n. (G-532); hb. Damasio s.n. (RB 38434); Damasio 12092 (RB-2 sh.); Damasio 7 (RB); Llano de Sta Martin, Jan 1856, 250 m, Triana 6636 (BM); Miquel Burnier, Oct 1906, Damazio 1805 (G-2 sh.); Baramaticos, Dec 1907, Barltelt s.n. (NY); Rio Nevade, Sta. Martha, Purdie s.n. (E).

W E S T I N D I E S A N D C E N T R A L A M E R I C A

C U B A. 1860-64, Wright 2328 (MO, not GH). PINAR DEL RIO: Pinar del Rio, 5-12 Sep 1910, Britton, Britton, & Gager 7099 (NY); l.c., 28 Mar 1900, Palmer & Riley 455 (US); Laguna Jovero, 5-7 Dec 1911, Shafer 10716 (F,NY); Palm barrens W of Guane, 21-22 Nov 1911, Shafer 10429 (F,MO,NY,US); Rio Guao, 17 Mar 1911, Britton, Britton, & Cowell 10120 (NY); Arroyo Montua Damuji, 1 Jun 1920, Ekman 11056 (NY, S). ISLE DE PINOS: June, Blain 29 (F); 17 Apr 1904, Curtiss 488 (BM,E,F,G,GH,M,MO,NY,PR); Nueva Gerona, 16 Oct 1920, Ekman 11665 (S); along hwy from Nueva Gerona to Santa Fe, 29 Apr 1951, Killip 41297 (US); between Nueva Gerona & McKinley, 23 Feb 1939, Victorin & Victorin 18779 (GH); nr McKinley, 16 May 1910, Jennings 298 (BM,GH,NY,US); Managua, 11 Jun 1900, Palmer & Riley 1097 (US); San Pedro, 12 Feb-22 Mar 1916, Britton, Britton, & Wilson 14306 (F,GH,MO,NY).

M E X I C O. Ruiz & Pavon, s.n. (BM); 1791, Haenke 1296 (PR); Isla Cha . . . efond [?], 1833, Mairet s.n. (G). VERA CRUZ: 17 km NE of Minatitlán, along Trans-Isthmian hwy, route 185, 50 m, 1 Aug 1958, King 940 (MICH). OAXACA: Dist. Choapan, trail Trinidad to Jaltepec, 325 m, 20 Apr 1938, Mexia 9305a (UC,US); Dist. Juchitan, Palomares,

300-500 ft, 8 Apr 1970, MacDougall s.n. (NY); Dist. Juchitan, between Matias Romero & Guichicori, 500 ft, 30 Apr 1970, MacDougall s.n. (NY, US). CHIPAS: Montocristo, 1945, Matuda 5935 (F); Cerro de Tonalá, Bergnriesen, Feb 1896, Seler 1894 (GH,NY). TABASCO: 10-40 km W of Huimanguillo, 20-29 Mar 1963, Barlow 30/8 (BM,MICH,WIS).

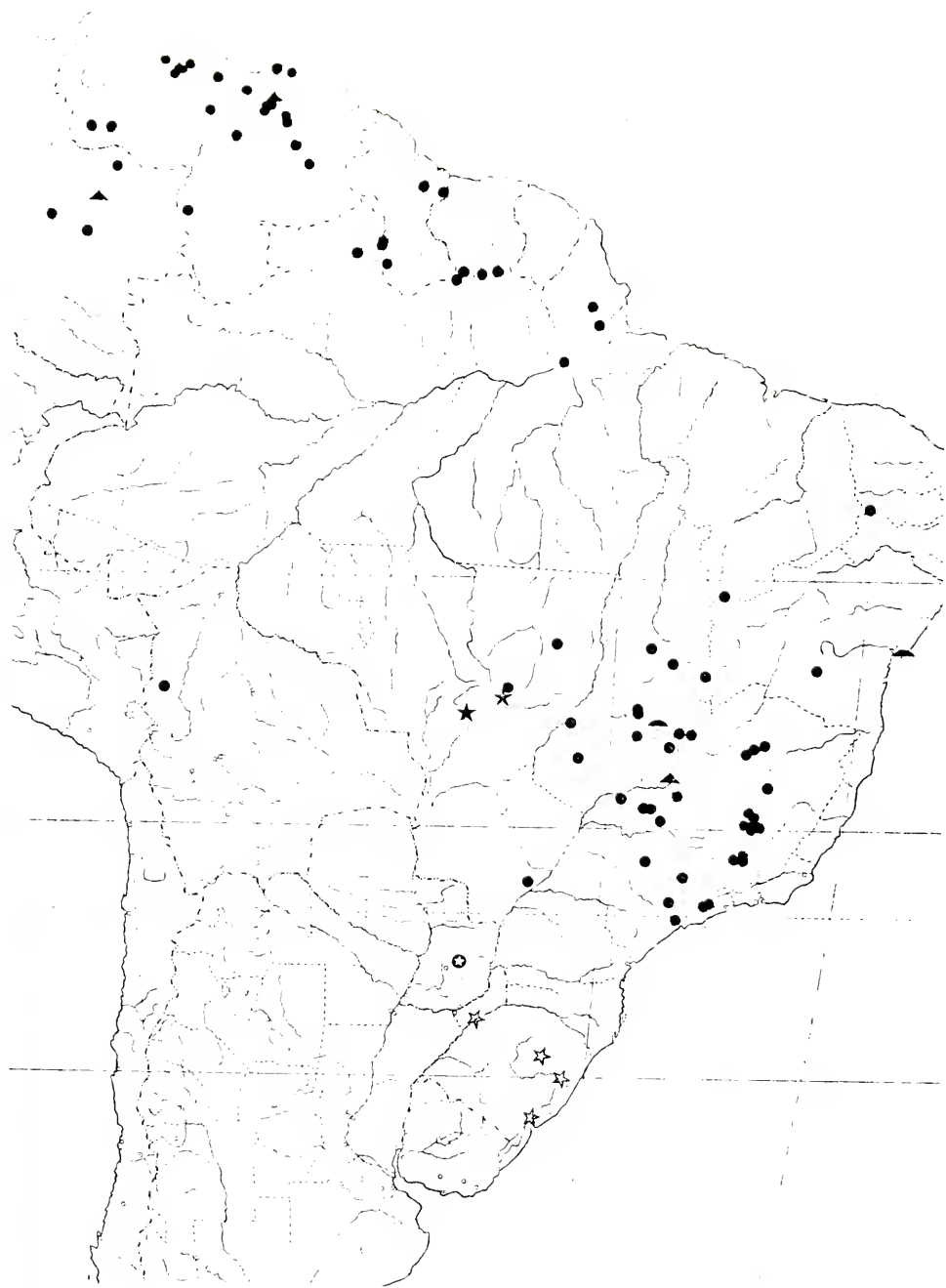
G U A T E M A L A. Mont Rincon, Friedrichstal 1223 (NY,W); E portions of Vera Paz & Chiquimula, 1885, Watson 483 (GH). ISABAL: 13 km E of Dona Maria, 340 m, 22 Jun 71, Harmon & Fuentes 5874 (UMO). PETEN: Sabanna San Francisco, La Libertad, 6 Jun 1933, Lundell 3653 (A,F,MICH,MO,S,US); Sabana Zizha, La Libertad, 9 Apr 1933, Lundell 2745 (F,MICH,US).

B E L I Z E (BRITISH HONDURAS). Big Fall Pine Ridge, Little Cocquericot, Belize R., 1 May 1933, Lundell 4394 (F,MICH); Mt. Pine Ridge, Habet's Rd, Augustine, 1800 ft, 16°34'N-88°45'W, 26 Aug 59, Hunt 6 (BMUC); pine ridge near Manatee Lagoon, 24 Sep 1905, Peck 141 (GH); pinelands between Mullins River & Manatee, 16 Aug 1940, Gentle 3381 (A,MICH); pine ridge near Jenkins Creek, 25 Aug 1942, Gentle 4088 (A,F,MICH,MO,NY,US).

H O N D U R A S. MORAZÁN: Las Mesas, 900 m, 14 Jul 1949, Molina 296 (F,GH); l.c., 800-900 m, 30 Oct 1948, Standley 13877 (F); El Zamorano, along road toward San Antonio de Oriente, 800-1000 m, 7 Jul 1949, Standley 20933 (F); l.c., 825-950 m, 9 Aug 1949, Standley 22332 (F); vic. El Zamorano, 780-900 m, 3-17 Aug 1947, Standley 12157 (F). EL PARAÍSO: entre Danli y Jacaleapa, 700 m, 15 Jul 1956, Molina 7517 (F); El Junquillo, 1300 m, 12 Jun 1964, Molina 14171 (F,NY).



Figure 114. South American distribution of two species of section Neurocarpum. Clitoria guianensis var. guianensis f. guianensis (●), f. imperfecta (▲), f. macrofructa (◐), var. chapadensis (★); C. nana var. nana (☆), var. caaguazuensis (⊛).



C O S T A R I C A. GUANACASTE: Volcan Orosi, 1200 m, Apr 1893, Shannon 5007 (US); ca 5 km S of La Cruz on Inter-Amer. Hwy. at junction with dirt road to coast, 260 m, 10 Jun 1967, Weston 5050 (F).

P A N A M A. CHIRIQUI: May 1958, Wagner s.n. (M). COCLÉ: Penonome, 25 Aug 1960, Ebinger 1011 (F,MO); l.c., 50-1000 ft, 23 Feb-22 Mar 1908, Williams 99 (NY-2 sh.); between Penonomi & Coclé, 20 Jul 1969, Stern et al. 987 (MO). PANAMA: below Cerro Campana, 9 Apr 1971, Croat 14192 (MO); Cerro Campana, 1 Sep 1940, Barlett & Lasser 16905 (MICH); l.c., 3/4 of way to summit from Pan Amer. Hwy., 31 Mar 1969, Dwyer, Croat, & Castillon 4844 (MO); Taboga Island, 4 Apr 1937, Miller Jr. 2022 (US); l.c., to 300 m, 24 Jan 1935, Allen 115 (MO); l.c., 0-250 m, 20-23 May 1911, Pittier 3572 (NY).

#### S O U T H A M E R I C A

C O L O M B I A. White 5 (NY). CAUCA: Rio Patia, 1100 m, 14 Sep 1939, Sneidern 2310 (F,G,S,US); Rio Guachicono & Patia Cauca, 500-1200 m, Lehmann 7795 (F). TOLIMA: 9 Feb 1883, Lehmann 2561 (G). ARAUCA: Cravo Norte, 150 m, 8 Aug 1963, Soejarto 443 (GH). META: Caboyaro, Rio Meta, 10 Jan 1899, Sprague 49 (US). VICHADA: along Rio Vichada at Bopimí, ca 14 km W of San José de Ocuné, 100 m, 24 Jan 1944, Hermann 11087 (GH,NY,US).

B O L I V I A. Apolo, 4 Mar 1902, Williams 24 (NY,US).

V E N E Z U E L A. 7 Apr 1921, Grisol s.n. (P); Pleé s.n. (P); 1868, Stevens s.n. (NY). YARACUY: 12 Apr 1946, Burkart 16513 (VEN). CAROBORO: ca Valencia, 3 Jan 1920, Pittier 9423A (VEN); Hacienda de Cruz near San Joaquin, 600-800 m, 15 Aug 1918, Pittier 7997 (GH,US,VEN). COJEDES: entre Tinaquillo y Valencia, 28 Mar 1946, Burkart 16263 (VEN). BARINAS: ca Sta. Barbara, Apr 1942, Lasser 235 (VEN); Cl. Bolivia

(Pedraza), Feb 1953, Aristequieta 1633 (VEN). ARAGUA: entre Maracay y Güique, Apr 1939, Müller & Whetzel 260 (VEN); Valley Rio Liman, along new road to Ocumare de la Costa, 440-800 m, 17-18 Apr 1913, Pittier 6055 (US). GUARICO: Atagracia, 1 Jun 52, Curran 2275-4 (NY); Calabozo, 150 m, 16 Oct 1963, McKee 10806 (VEN); l.c., Estacion Biologica de las Llanos, Jul 1960, Aristequieta 4267 (VEN); l.c., Apr 1965, Aristequieta 5530 (VEN) and Aug 1965, 5737 (VEN). ANZOATEGUI: 1943, Lasser 783 (VEN); Region Santo Clara-El Guacey, Do. Miranda, 26 Mar-2 Apr 1950, Croizat 184 (F); Mesa de Guaripae, 230 m, 22 Mar 1940, Pittier 14285 (US); ca Soledad, 30 Sep 1939, Müller 821 (VEN); El Tigre, 29 Sep 1939, Müller 818 (VEN). SUCRE: Cumana-Caripe, 3000 ft, Mar 1846, Voyage of Funck & Schlim, Linden 704 (G); Cumana-Guanaquana, 2500 ft, May 1846, Voyage of Funck & Schlim, Linden 704 (CGE) and 1845, 704 (BM); Valley of Cocollar, 820 m, 28 Apr 1945, Steyermark 62386 (F, VEN); Los Altos, Jan 1842, Tamayo 2158 (VEN); La Lamita entre La Saban y Zurita, 500-600 m, 18 Aug 1973, Steyermark, Espinoza, & Manara 107788 (VEN); Cumbre de Montana de Machima, sur de Mochima, 18 km sureste de Cumama, 350-400 m, 16 Sep 1973, Steyermark, Manara, & Morilla 108576 (VEN). MONAGAS: Uberito, 27 Aug 1970, Aristequieta 7576 (VEN); Axonopus, 29 Aug 1970, Aristequieta & Virrueta 7591 (VEN); between 3.5-5.5 km NW of Jusepin along road to Monresa, 20-25 W, 220-250 m 28 Mar 1967, Pursell, Curry, & Kremer 8555 (NY,US). BOLIVAR: sabannas del Rio Hacha, region de Canaima, 200-500 m, 16-17 Feb 1964, Agostini 360 (VEN); Gran Sabana bei Canaima, Guayana, 500 m, 31 Mar 1969, Oberwinkler & Hertel 15351 (M-mixed); del Cerro Bolivar Ciudad, 350 m, Apr 1954, Aristequieta 2169 (VEN); between Bacalao & Santa Rosalia, 100-300 m, 27 Apr 1943, Killip 37641 (US); Vista Geral, Rio

Cotinga, 720 m, 10 Dec 1954, Maquire & Maquire 40192 (NY,RB); Sabana Vaipan, 25 Jan 1948, Phelps & Hitchcock 310 (NY); Sta Elena de Vairen, Alto Caroni, 19 Apr 1946, Lasser 1327 (NY,VEN); Gran Sabanna, Sta Elena, 8 Feb 1946, Tamayo 2704 (VEN-3 sh.). AMAZONIA: Guayapo, Bajo Caura, 100-120 m, 26 Apr 1936, Williams 12087 (F,VEN) and 21 Apr 1936, 11931 (F-2 sh.,US,VEN); Sabannas de El Meta ca de El Figre, 20 Jun 1940, Williams 13405 (VEN); Las Hicoteas, Feb 1942, Tamayo 2195 (VEN).

G U Y A N A (BRITISH GUIANA). Schomburgk s.n. (CGE,US,W); 1837, Schomburgk 2:66 (BM); Schomburgk 58 (E-mixed,F-mixed,W 18407; non BM, CGE,G,GH,W); Pavawacutoi Savanna, Feug Dist., 2500 ft, May 1926, Aelson 527 (NY); Mokomoko Creek, Nov 48, Forest Dept. Br. Guiana no. 496 (NY). ESSEQUIBO: Pirara, 1841-42, Schomburgk 412 (BM); savanna between Takutu R. & Kanuku Mts, 12-22 Mar 1938, Smith 3276 (NY); Basin Rupununi R., Isherton, ca 2°20'N, 9-15 Nov 1937, Smith 2413 (GH,NY); Lethem, Rupununi Dist., 13 Apr 1956, Irwin 547 (US). BERBICE: Waranana, Oct 1973, Cooper 29 (W); Berbice, Mar 1882, Jenman 1691 (NY); Corantyne R., British side [label bears title of Surinam], Oreala Savanna, 20 Nov 1954, Lindeman 6681 (NY,U); Berbice-Rupununi Cattle trail, Waruni-Ituni Savannas, 3 Jul 1919, Abraham 14 (NY).

S U R I N A M. Hostmann 1262 (BM,G,GH,U,W-2 sh.). NICKERIE: Sipaliwini Savanna, 3 Dec 1935, Rombouts 302 (U); l.c., slope of Lange Dijk hill, 3 km E of 4-Goebroedero Mts, 19 Oct 68, Oldenburger, Norde, & Schulz 311 (U); l.c., on N hillside of 4-Goebroedero Mts, 19 Sep 68, Oldenburger, Norde, & Schulz 139 (U); l.c., 285 m, Jan 1970, Oldenburger, Norde, & Schulz 1029 (U); Warrah Savanna, W von de Maratakka, 7 Apr 1951, Florschutz 1941 (U); Coesewijne Savanna, 11-12-1958, Donselaar 516 (U).

F R E N C H   G U I A N A. 1833-34, Leprieu 352 (G-2 sh.).

B R A Z I L. Anonymous 161, hb. Mus. Pet. (K); Burchell 2507 (GH) and 6312 (P) and 8626-3 (GH,NY,P); Schuch 61068 (synype of synonym, Neurocarpum longifolium: W-2 sh.); Schuch 6106 (W); Sellow 1013 (PR); 1887, Glaziou 15913 (G); Brasilia merid., Helmreichen 63 (NY,W); Meira Ponte, Glaziou 20908 (G); Campos Judiahy, Apr 1900, Novaes 259 (US); Duridinho, 8 Oct 1927, Jarneby s.n. (S) and 14 Oct 1927, s.n. (S). RIO BRANCO: Boa Vista, 6 Jun 1913, Kulhmann 769 (RB). AMAPÁ: Rio Araguari, along road from Porto Platón to Macapá, 18 Sep 1961, Pires, Rodriques, & Irvine 51077 (NY); Macapá, 22 Apr 1926, Ducke s.n. (RB). PARA: Arrayollas, munc. Almeirin, 23 Apr 1903, Ducke s.n. [=MG 3516] (RB); Parque Indigena do Tumucumaque, Rio Paru de Oeste Missão Tiriyo, 2°20'N-55°45'W, 14 Feb 1970, Cavalcante 2388 (NY,US). CEARÁ: Sr. de Araripe, Araras, 18 Oct 34, Luetzelburg 26356 (M). BAHIA: campis ad Caiteté et Rio das Contas, Oct, Martius s.n. (syntype of synonym, Neurocarpum longifolium: M 12435). MATO GROSSO: ca 6 km S of Xavantina, 14°38'S-52°14'W, Oct 1967, Argent et al. 6748 (NY); ca 94 km N of Xavantina, 550 m, Serra do Roncador, 4 Jun 1966, Irwin et al. 16565 (NY,RB,UMO,W); ca 1 km NE of Garapa, 13°12'S-52°34'W, 1 Oct 1964, Irwin & Soderstrom 6511 (NY); Braco, Rio Arinos, 26 Sep 1943, Baldwin 3083 (US). GOIÁS: Serra Dourada, 1969, Rizzo 4429 (RB) & 4541 (RB); campas, Mission of Duro, Oct 1839, Gardner 3101 (BM,CGE-2 sh.,G,W); Aragarcas, 14 Sep 56, Sick 1 (RB); Posto de Criacao, 11-4-1959, Otero 9 (RB-2 sh.); Serra de Caiapo, ca 38 km S of Caiaponia on road to Jatai, 17°12'S-51°47'W, 800-1000 m, 18 Oct 1964, Irwin & Soderstrom 7002; Serra de Caiapo, ca 40 km S of Caiaponia, 27 Oct 1964, Irwin & Soderstrom 7470 (GH,MO,NY,RB); Serra do Cristais, ca 5 km S of Cristalina, 17°S-48°W,

1200 m, 4 Mar 1966, Irwin et al. 13424 (NY); Serra Geral de Goiás, Rio Parana, ca 35 km N of Formosa, 14°S-46°W, 950 m, 30 Mar 1966, Irwin et al. 14276 (NY,UMO); Rio Piau, ca 225 km SW of Barreiras on road to Posse, 850 m, 12 Apr 1966, Irwin et al. 14630 (GH,MO,NY,RB); Serra de Pirireus, ca 14 km S of Corumba, 975 m, 30 Nov 1965, Irwin, Souza, & Santos 10764 (NY); 15 km N of Corumba, on road to Niquelandia, ca 1150 m, 15 Jan 1968, Irwin, Maxwell, & Wasshausen 18631 (BM,NY) and 25 km N of Corumba, 13 Jan 1968, 18523 (NY) and 75 km N of Corumba, ca 700 m, 19 Jan 1968, 18848 (NY); Parque Nacional do Tocantins, 4 km W de Veadeira-Calina, 23 Aug 67, Haas, Haas, & Belem 194 (U). MINAS GERAIS: Hb. Miers, Claussen s.n. (BM); Mar 1839, Claussen s.n. (F, G-2 sh.); Aug-Apr 1840, Claussen s.n. (CGE); Claussen 911 (S); Sep 1839, Claussen 98 (BM); Uberaba in campo, 18 Aug 1848, Regnell II:81 (S); Regnell II:81b (S); Regnell 438xx (S); Riedel s.n. (A); Oct 1824, Riedel 796 (US,W); Schuck s.n. (BR-5 sh.); R. Preto, Sipolis 16 (P); Prata, Amineiro, 18 Sep 49, Labrin 833 (RB); Lagoa Santa, Warming 3044 (F) and 3048 (G); l.c., 11 Sep 52, Barreto 42 (F); l.c., 8 Aug 1949, Rizzini s.n. (RB); Mun. Santa Luzia, Fazenda da Chicaca, 100 m, 20 Nov 1945, Assis 140 (GH); Sete Lagoa, 28 Sep 67, Silva 120 (RB); Tejuaro, May-Jun, Martius s.n. (M); Jundiahy et S. João del Rey, Martius s.n. (syntype of synonym, Neurocarpum longifolium: M); inter Barbacena et S. João del Rey; 1836, Pohl 505 (syntype of synonym, Neurocarpum frigidulum: K,S=photo of K,W); Serro Frio, Jun, Martius s.n. (syntype of synonym, Neurocarpum frigidulum: M 12433); Caldas, Pocos, 1843, Regnell II:81 (S-2 sh.); Bento Pires near Belo Horizonte, 1000 m, 13 Mar 1945, Williams & Assis 5922 (GH) and 6122 (GH); near Lagoa Pampilha, 900 m, 19 Sep 1945, Williams & Assis 7581 (NY); Serra do

Taquaril, 17 Oct 1937, Barreto 8828 (F); Bello Horizonte, 8-1-1919, Gehrt 3259 (GH); l.c., Serra Curral [?], 1200 m, Sep 1929, Amarita 29 (RB); Serra de Diamantina, 20 Nov 1964, Duarte 8643 (RB); ca 25 km SW Diamantina on road to Gouveia, 1300 m, 1969, Irwin et al. 27835 (NY); proximo Horto Florestal, 27 Nov 1940, Occhioni s.n. (FLAS! RB); Carandai, 14 Dec 1946, Duarte 438 (RB); Mun. Ituiutaba, 16 Oct 1943, Macedo 28 (MO,S); entre Pirapora e Montes Glaros, 18 Sep 63, hb. Brade 28416: Santos s.n. (NY); ca 25 km W Corinto, 525 m, 3 Mar 1970, Irwin et al. 26840 (NY,UMO,W); ca 26 km NE Patrocinio, 100 m, 29 Jan 1970, Irwin et al. 25574 (NY,W); ca 75 km W of Paracatu, 850 m, 4 Feb 1970, Irwin et al. 26044 (NY,UMO); campo de Pinheiros, Hermillo Alves, 1100 m, 26 Dec 1949, Duarte 2371 (FLAS! RB); Serra do Clarto, Montes Claras, 10 Nov 1938, Barreto & Brade 3362 (RB); Cachocrin de Campo, Damayo 340 (G); ca 30 km NE Francisco Sa, road to Salinas, 1100 m, 10 Feb 1969, Irwin et al. 23036 (MO,NY); Mun. Betim, Fazenda do Cabui near Contagem, 900 m, Feb 1945, Williams, Assis, & Moreira 5416 (GH, UC); Mun. Caete, Fazenda Geriza, 19°57'S-43°42'W, Felippe 23 (RB); 15 km W of Caete on road to Sabara, Hwy 31, 6 Jan 1959, Irwin 2384 (NY, UC,US). SÃO PAULO: 1839, Guillenin 501 (G); Campinas São Paulo, 26 Sep 1904, Heiner 224 (F,G,S-2 sh.); São Bernardo, Dec 1911, Brade 5643 (BM,S); Jabuticabal, Jan 1918, Anonymous s.n. (RB-2 sh.); Parque do Estado, 4 Jan 1934, Hoehne 31387 (NY; S. Jose dos Campos. 22 Nov 07, Löfgren 181 (RB,S); l.c., 6.5 km, ca 600 m, 10 Oct 1961, Mimura 5 (F, NY); ca 7.3 km SSE São Jose dos Campos, 620-650 m, 30 Jan 1962, Mimura 243 (US); Taubate et Mugi, Nov 1833, Riedel 1560 (BM,US).



53ab. Clitoria guianensis (Aubl.) Benth. var. guianensis f.  
macrofructa Fantz, f. nov.

Leaves 3-foliolate. Legumes from chasmogamous flowers elongated, 6-7 cm long, costate the medial nerve very prominently raised and extending the length of the valve. Figure 113.

TYPE COLLECTION: BRAZIL. Bahia: steinigen Hügeln der Tabaleiros bei S. Antonio, 22 Oct 1912, Zehutner 424 (HOLOTYPE: M-hb. Lützelburg 3018. Isotype: RB 6340).

Additional data borne on the label is in German script and difficult to read, but appears to be as follows: "Blütfruh am Vormittag und ist jeweilen eine Blute am vernreiken und eine frut ausgegangen. Forbe der Blüten au . . . seits weiss, niner blau. Zurichen S. Rita & Barreiras."

Legumes from chasmogamous flowers of members of the subgenus Neurocarpum are consistent in their length of 3.5-6 cm, except for the larger fruits found within this form of C. guianensis. These fruits commonly bear 11-14 seeds per pod, whereas the typical legume of C. guianensis bears only 6-10 seeds per pod.

DISTRIBUTION (Figure 114). This form is known only from one additional locality in addition to the type locality.

B R A Z I L. GOIÁS: Camop slope immediately E of Logôa Paranoá, D.F., 975 m, 11 Dec 1965, Irwin et al. 11214 (Paratype: NY).

53ac. Clitoria guianensis (Aubl.) Benth. f. imperfecta Fantz,  
f. nov.

Leaves 3-foliolate and occasionally 1-foliolate. Legumes 2.5-5.3 cm long, ecostate, or costate with the medial nerve weakly raised,

imperfectly formed, extending from one-quarter of the length of the valve to nearly the entire length of the valve, becoming subimpressed toward the base. Figure 113.

TYPE COLLECTION: VENEZUELA. Anzoategui: Santome, 250 m, Pittier 14589a (HOLOTYPE: VEN 4017).

The form is easily recognized by the ecostate fruits or the imperfectly formed medial nerve, a trait also found in C. laurifolia and C. falcata. Usually an individual plant will have a mixture of these legume types. Pittier 4017 has ecostate fruits as well as those which bear the medial nerve extending from one-quarter to three-quarters of the length of the valve.

DISTRIBUTION (Figure 110 and 114): This form occurs infrequently within the range of the species.

C U B A. 1860-64, Wright 2328 (G,GH: non MO). PINAR DEL RIO: Libio del Fufierno, 14 Jun 1923, Ekman 16720 (S). ISLE DE PINOS: 25 Jun-10 Jul 1901, Taylor 125 (NY,US).

H O N D U R A S. MORAZAN: San Antonio de Oriente, 900 m, 8 Sep 1943, Rodriguez 654 (F-2 sh.). EL PARAISO: 20 km N de Yuscarn, entre El Empalme y Quebrada El Muro, 14°N-87°W, 600 m, 11 Jul 1951, Molina 4005 (F,GH); region of Quebrada de Dantos, 5 km S of Ojo de Agua, 750 m, 11 Dec 1946, Standley, Williams, & Molina 1283 (F).

C O L O M B I A. BOYACA: near Orocué, 140 m, 29 Mar 1939, Haught 2720 (US).

V E N E Z U E L A. ANZOATEGUI: Santome, 2-6 Jun 1942, Pittier 15017 (UC,US,VEN).

B R A Z I L. MATO GROSSO: Campo in S. Anna de Chapada, 23-30 Jul 1902 and 8 Oct 1902, Malme 2141 and 2141a-d (S-5 sh.). GOIÁS: ca 24 km

NE of Catalao, 875 m, 22 Jan 1970, Irwin et al. 25098 (NY); 10 km S of Guara, 550 m, 18 Mar 1968, Irwin, Maxwell, & Wasshausen 21348 (NY-2 sh.).

53ad. Clitoria guianensis (Aubl.) Benth. f. unifoliata Fantz,  
f. nov.

Leaves 1-foliolate. Legume not seen.

TYPE COLLECTION: BRAZIL. Paraná: Itararé opp. Morungava, 740 m, 30 Jan 1915, Dusén 16604 (HOLOTYPE: GH).

Stems typically bear only 3-foliolate leaves or occasionally have one or two unifoliolate leaves at lower nodes. Dusén 16604 bears only unifoliolate leaves at each node which are sessile, attached by their petiolules, oblong-lanceolate, commonly 7.5-13.5 cm long and 2.5-4 cm wide. Plants bearing only unifoliolate leaves are rare within the genus. Clitoria simplicifolia is a closely related species to bear only unifoliolate leaves in the neotropics, and is distinguished by the shorter and broader leaves which are glabrous above, the shorter calyx tube and lobes, smaller bracteoles, and slightly smaller flowers. Plants of the Asian tropics are distinguished by stalked unifoliolate leaves.

DISTRIBUTION: The form is known only from the type locality.

53b. Clitoria guianensis (Aubl.) Benth. var. macrocleistogama  
Fantz, var. nov.

Leaves 3-foliolate; leaflets elongated, linear to lanceolate, 7-16 cm long, 1-1.8 cm wide. Petioles 10-20 mm long; rachis 8-18 mm long. Stipules 5-8 mm long, 2-3 mm wide. Calyx tube of cleistogamous flowers elongated, 9-12 mm long. Legumes weakly costate, the medial nerve

extending nearly the entire length of the valve; stipes elongated, 14-20 mm. Figure 115.

TYPE COLLECTION: BRAZIL. Minas Gerais: Serra da Caracol prope prodium Brata in campo alto alto audo preta. 20 Dec 1875, Mosen 4082 (HOLOTYPE: S-mounted on two sheets).

Cleistogamous flowers within the genus Clitoria are inconspicuous and consistent in the tube length of 4-8 (9) mm. The calices of cleistogamous flowers in this form of C. guianensis are conspicuous by their larger size. The stipe and leaf stalks are elongated, a trait uncommon within the species. Chasmogamous flowers are present and similar to those of the typical variety.

DISTRIBUTION: This form is known only from the type locality.

53c. Clitoria guianensis (Aubl.) Benth. var. chapadensis (Malme)

Fantz, comb. nov.

Clitoria chapadensis Malme, Ark. Bot. Stock. 23: 82. 1931.

Clitoria guyanensis (Aubl.) Benth. f. chapadensis (Malme)

Rizz., Arq. Jard. Bot. Rio de Janeiro 17: 184. 1963.

Leaves 3-foliate and occasionally 1-foliate; leaflets short and broadened, oblong-elliptic to oblong-obovate, 5-5.9 cm long, (2) 2.5-4 cm wide. Petioles subsessile, 3-6 mm; rachis subsessile, 2-5 mm. Stipules large, 7-12 mm long, 4-5 mm wide. Calyx tube of cleistogamous flowers 5-8 mm. Legumes costate, the medial nerve prominently raised and extending nearly the entire length of the valve. Figure 115.

TYPE COLLECTION: BRAZIL. Mato Grosso: Santa Anna de Chapada, 5 Aug 1902, Malme II:2067b (LECTOTYPE: S. Isolectotypes: all at S;

Figure 115. Clitoria guianensis - II. Var. chapadensis: (a) habit, x 1. Var. macrocleistogama: (b) leaf, x 1; (c) cleistogamous flower with legume, x 1; (d) legume from cleistogamous flower, x 1. (Malme 2067b, S: a. Mosen 4082, S: b-d.)



l.c., 24 Jul 1902, Malme 2067, and 2 Aug, 2067a, and 10 Aug, 2067d, and 26 Sep, 2067e).

Malme cited the type collection of C. chapadensis as Malme 2067a-e. This collection represents a series of plants collected from one generalized locality over a period of time, and examination of these specimens gives an indication of the growth of the plant. Malme 2067, 2067a, and 2067e represent immature plants with small leaves and early flowering. Malme 2067b has the best material and is selected as the lectotype. It bears mature leaves (both 3- and 1-foliate leaves) and chasmogamous flowers. Malme 2067d is similar, but lacks 1-foliate leaves and has less flowering material. Malme 2067c includes one plant with cleistogamous flowers and fruits.

Rizzini (1963) was the first to combine C. chapadensis with C. guianensis, placing Malme's name at the level of the form based upon the broader leaflets and somewhat longer attenuate base. Malme had commented on the affinities of his new species with C. guianensis and noted that it may represent a variety or form of C. guianensis. This present study treats Malme's taxon at the level of variety because of the differences in other structures (i.e. stipules, petioles) as well as the leaves when compared to the typical variety of C. guianensis. Leaves of this variety appear to be a darker green than those found within the typical variety. Members of this variety bear a superficial similarity in vegetative structures with C. irwinii which can be distinguished by the sessile inflorescences, white flowers, larger stipules, and leaflets which have a rotund base and are glabrous on the upper surface.

DISTRIBUTION (Figure 114): This variety is known only from the state of Mato Grosso, Brazil.

B R A Z I L. MATO GROSSO: Santa Anna de Chapada, 8 Sep 1902, Malme 2141D (S); l.c., 1 Aug 1902, Robert 462 (BM); l.c., 1902-03, Robert s.n. (BM); l.c., 20 Oct 1902, Anonymous s.n. (BM); Cuiaba, Schwacke 4494 (RB).

54. Clitoria epetiolata Burkart, Darwinia 8: 488. 1949.

Subshrub to perennial suffrutescent herb, erect, 25-70 cm tall. Stems renewed annually from subterranean xylopodium, several, rigid, sublignose, occasionally branched near base, unbranched above, fire-tolerant, longitudinally striated, subterete, 1-3 mm in diameter, glabrate with sparse, appressed trichomes; branches short, typically bearing only one leaf and a terminal inflorescence. Xylopodium subterranean, horizontal, lignose, proximal portion knobby at apex where aerial stems arise, 5-8 cm long, 1.5-3 cm thick, often with a distal portion that is 9-30 cm long, 5-18 mm thick, tapering gently and decreasing in thickness toward far distal end. Leaves sessile, digitately 3-foliate, subcoriaceous, leaflets elongated, oblong-linear, linear, or oblong-lanceolate, apex broadly acute to obtuse, mucronate, occasionally emarginate on obovate leaflets of lower leaves, base attenuate to cuneate, nerves numerously reticulated on both surfaces, prominently raised below, midrib impressed in upper leaf surface and nearly completely projected above the lower leaf surface, primary nerves of 6-12 pairs, upper surface green, more or less glossy, uncinately pubescent to glabrate, lower surface pale, glaucescent (?), sparingly



strigose or bearing 1 mm long trichomes, sericeous to subvillous, lamina (4.5) 6-12 (16) cm long, 0.3-3.0 cm wide; terminal leaflet nearly equal to slightly longer than lateral leaflets. Petioles absent; rachis absent. Petiolules 2-3 mm, darkened, moderately pilose becoming glabrate. Stipules persistent, lanceolate, acute, 4-8 (9) mm long, 1.5-2.5 (3) mm wide, glabrate to sericeous-pilose pubescent; stipels deciduous, minute and difficult to observe, setaceous, ca 0.2-0.5 mm long. Inflorescences axillary, solitary, racemose, (1-) 2- (3-4) flowered, bearing chasmogamous or cleistogamous flowers, rarely chasmocleistogamous; chasmogamous flowers typically borne from inflorescences of upper nodes and sometimes also borne at lower nodes; peduncles 2-11 cm, typically bearing one pair of flowers at its truncate apex, rarely bearing minute set of leaflets; axis pubescence appressed. Pedicels 2-6 (9) mm long. Bracts of inner whorl deciduous, between the pedicels, slightly smaller than those of middle whorl; middle pair of bracts opposite pedicels, persistent; outer whorl of bracts lacking. CHASMOGAMOUS FLOWERS showy, purplish to violet, 5-7 cm long. Bracts 4-6 mm long, 1-2 mm wide. Bracteoles persistent, lanceolate, acute, 5-12 mm long, 2-4 mm wide, borne 0.5-1 mm to occasionally 1-4 mm below the calyx, pubescence strigose and ciliate. Calyx pubescence appressed, moderately spaced, and uncinat, tube 15-25 mm long, 5-8 mm wide at base to (6) 9-14 mm wide at the throat, lobes broadly lanceolate, acuminate, strigose, more or less ciliate, 7-11 (14) mm long, ca 5-6 mm wide near base, ventral lobe narrower and slightly longer. Vexillum broadly obovate to nearly orbicular, 4-6 cm wide, glabrate with uncinat pubescence along veins to moderately strigose on dorsal surface, claw 8-9 mm. Alae extended well beyond carina by

13-15 mm, blade oblong, slightly falcate, 23-33 mm long, 8-12 mm wide, apex truncate and often minutely ciliolate, claw 13-18 mm. Carina falcate, blade 13-18 mm long, 4-6 mm wide, claw 21-30 mm. Staminal tube elongate, 33-36 mm long, incurved near apex, free filaments 2-4 mm; anthers elliptic, 1.5-1.8 mm long, 0.8-1 mm wide. Gynophore 5-6 mm; densely uncinete, ovary 10-11 mm long, 1.2-1.3 mm wide, densely uncinete-pubescent with whitish, spreading trichomes laterally; style 19-24 mm, geniculate 7-8 mm from the distal end; stigma subglobose, dilated, ca 0.5 mm diameter. Legume unknown. CLEISTOGAMOUS FLOWERS minute, inconspicuous. Bracts 3-4.5 mm long, 0.5-1 mm wide. Bracteoles persistent, lanceolate, acute, 4-6.5 mm long, borne 0.5-1 mm below the calyx. Calyx tube 6-10 mm long, 1.5-2.5 mm wide at the base expanding to 2-4 mm wide at the throat, lobes 3-6 mm long, ca 1.5 mm wide. Petals lacking or rarely present, 1 mm long, translucent. Staminal tube sublacking, ca 0.5 mm, free filaments 2-4 mm; anthers elliptic, 0.8-1 mm wide, 0.6-0.8 mm wide. Gynophore 2 mm; ovary 6 mm long, uncinete-pubescent with densely pilose laterally; style 5 mm, abruptly bent backward and in contact with anthers. Legume stipitate, convex, ecostate, turgid, light brown, straight to slightly falcate, 3-5.5 cm long, 8-11 mm wide, valve surface minutely, obliquely striolate, sutures thickened; stipe 8-12 mm; beak 2-5 (9) mm, abruptly incurved; dehiscence causing valves to twist one turn. Seeds dark reddish-brown, viscid, subglobose to slightly longer than wide, base nearly truncate, lateral surfaces with shallow concavity, 3-5 (5.5) mm long, 3-4 mm wide, 3-7 seeds per pod. Figure 116.

PHENOLOGY: Cleistogamous and chasmogamous flowers have been collected from September to March 1. Fruits from cleistogamous flowers

Figure 116. *Clitoria epetiolata*. Var. *epetiolata*: (a) habit, x 1; (b) leaflet, x 1; (k-l) legumes, x 1; (m) three views of seed, x 1. Var. *angustissima*: (c) leaflet, x 1. Var. *latuscula*: (d) leaflet, x 1; (e) flower, x 1; (f) calyx, x 1; (g) vexillum, x 1; (h) ala and carina, x 1; (i) androecium, x 1; (j) gynoecium, x 1. (Hassler 4344, NY: a. Pedersen 3109, US 2169390: b,k-m. Hoehne 23404, A: c. Rojas 10561, G-84: d-j.)



have been collected from late November through January, with one collection of April 5 bearing dehiscent fruits.

Digitate-leaved Clitoria is characterized as a suffrutescent herb with epetiolate, digitately, 3-foliate leaves, pedunculate inflorescences bearing pairs of medium-large purplish flowers, and turgid, ecostate fruits.

TYPE COLLECTION: ARGENTINA. Saladas, provincia de Corrientes, Feb 1917, Hauman 423d (HOLOTYPE: BA 12027).

NOTES: Clitoria epetiolata has close affinities with C. guianensis which is distinguished by leaves bearing a distinct petiole and rachis, broader leaflets, longer petiolules, longer style, a lack of macroscopic trichomes on the ovary, costate fruits, and the occasional production of unifoliate leaves. (Clitoria epetiolata is a poorly known species as most of its collections were misidentified as C. guianensis).

Clitoria epetiolata exhibits three distinct groups that can be distinguished easily by the width of the leaflets alone, with other characters supporting the segregation into three varieties.

DISTRIBUTION (Figure 117): This species is known from Paraguay, and the states of Corrientes, Argentina, and Paraná, Brazil, growing in sandy soils of open grasslands on mountain slopes. Elevations are not reported by the collectors.

#### KEY TO VARIETIES:

1. Leaflets narrow to medium-width, 3-12 (17) mm wide; lower surface of leaflets bearing a few, scattered, appressed trichomes ca 0.5 mm long; calyx tube usually 6-11 mm wide at the throat, lobes 7-11 mm long; flowers average shorter, 5-7 cm.

2. Leaflets 6-12 (17) mm wide; calyx tube 9-11 mm wide at the throat; bracteoles 7-12 mm; common (Paraguay, Argentina) . . . . . 54a. var. epetiolata
2. Leaflets narrow, 3-5 mm wide; calyx tube narrow, 6-9 mm wide at the throat; bracteoles 5-7 mm; rare (Brazil). . . . . 54b. var. angustissima
1. Leaflets broad, 15-30 mm wide; lower surface of leaflets sericeous, trichomes ca 1 mm long; calyx tube broad, 13-15 mm wide at the throat, lobes 11-13 mm long; flowers average longer, 6-8.5 cm (Paraguay, Brazil). . . . . 54c. var. latiuscula

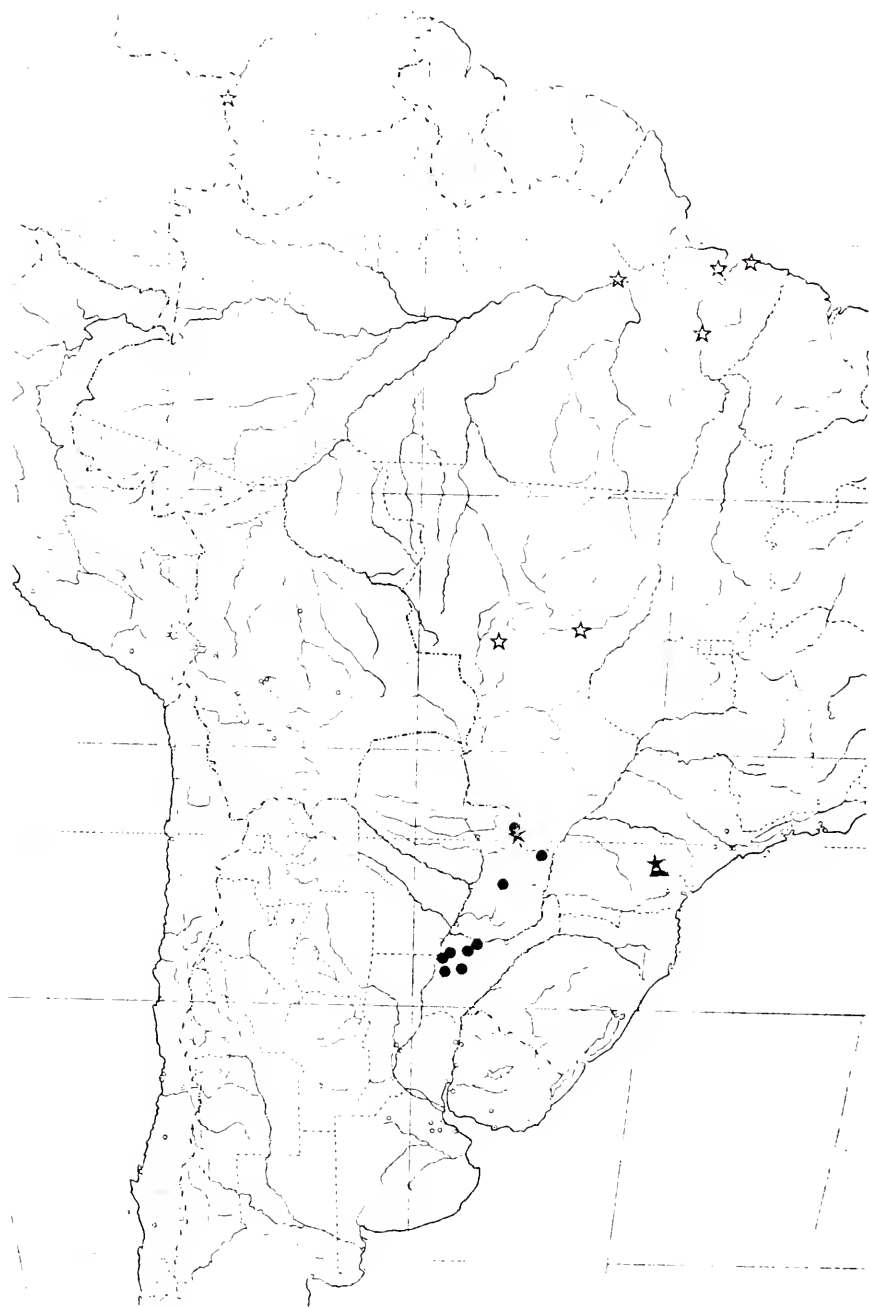
54a. Clitoria epetiolata Burk. var. epetiolata.

Leaflets 6-12 (17) mm wide, lower surface bearing a few, scattered, appressed trichomes ca 0.5 mm long. Stipules 4-9 mm. Flowers 5-7 cm. Calyx tube 15-23 mm long, 9-11 mm wide at the throat, lobes 7-11 mm. Bracteoles 7-12 mm. Figure 116.

DISTRIBUTION (Figure 117): The typical variety is collected from dry sandy soil in grasslands of mountain slopes in Paraguay and the province of Corrientes, Argentina.

P A R A G U A Y. Sierra de Amambay, in altaplanitie et declivibus, Sep 1907-08, Rojas 10623 (BM,F,G-2 sh.,NY,S,UC,W); Serro Torin, Sierra de Amambay, Nov 1921, Rojas 3943 (Paratype: SI-not seen); Sierra de Maracayo in regione flum. Tapiraguay ad "Yerbales," Aug, Hassler 4344 (BM,F,G-3 sh.,GH,MO,MPU,NY,S,UC,W); Sierra de Tobaty, 2 Jan 1957, Archer & Rojas 4888 (Paratype: SI-not seen. Isoparatype: GH!); prope Caaquazu, Mar 1905, Hassler 9241 (G-2 sh.).

Figure 117. South American distribution of two species of section Neurocarpum. Clitoria simplicifolia (☆); C. epetiolata var. epetiolata (●), var. angustissima (◐), var. latiuscula (★).





A R G E N T I N A. CORRIENTES: Dept. Concepción, El Batel, paso Croceita, 11 Feb 1968, Krapovickas, Cristóbal, & Ahumada 13798 (MO,SI,UC,US,WIS): Dept. Concepción, Estancia Santa Rosalia, 4 Jan 1955, Pedersen 3109 (MO,S,US); Dept. Mburucuyá, Estancia Santa Teresa, 22 Nov 1951, Pedersen 1334 (A,G,MO,NY,S,U,US-2 sh.); Dept. San Roque, Estancia Caaguazú, 1 Mar 1961, Pedersen 5868 (A,K); Dept. San Roque, Cautillas, 5 Apr 1945, Larrola 2859 (A,NY); Dept. San Miquel, 21 km S de Loreto, 7 Mar 1974, Schinini et al. 8234 (SI); Dept. San Miquel, Loreto, 1946, Barro 4082 (W); Mantilla, Feb 1949, Crovetto & Leguizamón 5500 (Paratype: BAB-not seen. Isoparatype: SI!).

54b. Clitoria epetiolata Burk. var. angustissima Hoehne ex Fantz, var. nov.

Clitoria guyanensis (Aubl.) Benth. f. angustissima Hoehne, nom. in sched.

Leaflets 3-5 mm wide, lower surface bearing a few, scattered, appressed trichomes ca 0.5 mm long. Stipules 4-6 mm. Flowers 5-5-6.5 cm. Calyx tube 16-19 mm long, 6-9 mm wide at the throat, lobes 7-9 mm. Bracteoles 5-7 mm. Figure 116.

TYPE COLLECTION: BRAZIL. Paraná: Jaguariahyva, 5-11-1928, Hoehne 23404 (HOLOTYPE: GH).

Hoehne's name has not been published, but his basionym is adopted for this variety which is easily distinguished by the very narrow leaflets of 0.3-0.5 cm wide. This variety is rarely collected. Leaves of Hatschbach 12962 appear to be black-punctate, a probable fungal infection.

DISTRIBUTION (Figure 117): This variety is known from cerrado and campos of Paraná, Brazil.

B R A Z I L. PARANÁ: Campo Mourão, 13 Oct 1965, Hatschbach 12962 (F,SI); campo near Jaguariaiva, 17 Oct 1966, Lindeman & Haas 3113 (U).

54c. Clitoria epetiolata Burk. var. latiuscula Burk., Darwiniana 8: 493. 1949.

Leaflets 15-30 mm wide, lower surface sericeous, trichomes ca 1 mm long. Stipules 6-8 mm. Flowers 6-8.5 cm. Calyx tube (17) 23-25 mm long, 13-15 mm wide at the throat, lobes 11-13 mm. Bracteoles 9-11 mm. Figure 116.

TYPE COLLECTION: PARAGUAY. Sierra de Amambay, Cerro Torin, en campo de loma, Nov 1921, Rojas 3943a (HOLOTYPE: SI-photo of specimen seen).

The leaflets of this variety are more closely matched to those of C. guianensis in size, but lack the distinct petiole and rachis of that species. Specimens examined agree with the photo of the type and with Burkart's description of the variety. This variety is easily distinguished by its broader leaflets.

DISTRIBUTION (Figure 117): This variety is infrequently collected in Paraguay and Paraná, Brazil.

P A R A G U A Y. Sierra de Amambay, Sep 1907-08, Rojas 10561 (BM,G-3 sh.,NY,W).

B R A Z I L. PARANÁ: Campo Mourao, 13 Oct 1965, Hatschbach 12968 (F,SI); Jaguariaijva, 26 Oct 1910, Dusén 10369 (S).

55. Clitoria simplicifolia (Kunth) Benth., Journ. Linn. Soc.

2: 40. 1858.

Neurocarpum simplicifolium Kunth., Mimos 213, t. 59. 1824.

Ternatea simplicifolia (Kunth) Kuntze, Riv. Gen. Pl. 1: 120.

1891.

Subshrub to perennial suffrutescent herb, erect to ascending 15-50 cm tall. Stems arising from apex of xylopodium or from stolons, erect to ascending, somewhat flexuous, unbranched, lignose, longitudinally striated, 1.5-3 mm thick; internodes 1-8 cm, often hidden by leaves, arcuate to straight; juvenile stems sparsely uncinata becoming glabrate to glabrous. Xylopodium subterranean, lignose; knobby apex bearing 1-3 aerial stems, 4 to ? cm long, 7-15 mm thick. Stolons horizontal, subterranean (?), lignose, bearing minute stipules of 1.5-2.5 mm and bearing aerial stems from distal nodes. Leaves 1-foliate, sessile, subcoriaceous, more or less ascending, elliptic to elliptic-oblong or broadly oblong, apex obtuse to truncate, weakly retuse or abruptly minutely acuminate, mucronate, base rotund to weakly cordate, midrib impressed above, primary nerves of 7-10 pairs, upper surface slightly dark green, glabrous, lower surface pale, nearly glabrate with trichomes spreading, confined to major nerves, lamina 6.5-11.5 cm long, 3-7 (7.5) cm wide. Petioles absent; rachis absent. Petiolules quadrangular, more or less wing-like on the angles, 3-5 mm long. Stipules lanceolate, acuminate, 4-8 mm long, 1.5-4 mm wide, pubescence sparse, uncinata with few macrotrichomes, ciliate; stipels lacking. Inflorescence axillary, racemose, biflowered, bearing chasmogamous or cleistogamous flowers; peduncle 1-4.5 cm, often hidden by the leaf,

sparsely pubescent. Pedicels 5-7 mm. Bracts lanceolate, acuminate, nearly equal, 3-5 mm long, 1-3 mm wide, pubescence uncinata, ciliate.

CHASMOGAMOUS FLOWERS showy, pale blue to pale violet with vexillum having a yellow center, 5-7 cm long. Bracteoles lanceolate, acuminate, 6-8 mm long, 2-3 mm wide, inserted 0.5-2 mm below the calyx base, pubescence uncinata, ciliate, with sparsely, appressed trichomes. Calyx 10-nerved, pubescence uncinata, more or less glabrate with scattered, subappressed trichomes of 1-2 mm long, tube 15-21 mm long, 3-6 mm wide at the base expanding to 7-10 mm wide at the throat, lobes ovate, acuminate, (6) 8-12 mm long, 4-6 mm wide, ciliate. Vexillum pubescence moderately dense, appressed, especially prominent along complicate margin and peripheral margins, blade ca 4-4.5 cm wide, claw 6 mm. Alae extended well beyond the carina by 9-12 mm, blade 27-30 mm long, 6-10 mm wide, claw 17-20 mm. Carina 13-15 mm long, 5 mm wide, claw 26-34 mm. Staminal tube 30-38 mm, free filaments 4-5 mm; anthers elliptic, 1.5-2 mm long, 0.7-1 mm wide. Gynophore 6 mm, densely uncinata-pubescent; ovary 9 mm long, 1 mm wide, weakly costate, densely uncinata-pubescent; style 25-27 mm, geniculate ca 8-10 mm from the distal end; stigma ca 1 mm in diameter. Legume not seen. CLEISTOGAMOUS FLOWERS minute, rarely collected. Bracteoles 3 mm long, 1 mm wide. Calyx tube 6 mm long, lobes 4 mm. Staminal tube ca 0.5 mm long, free filaments 4-5 mm. Gynoecium observed in fruit only. Legume stipitate, weakly costate, brown, 3.5-4 cm long, 6-7 mm wide. pubescence uncinata with short, scattered trichomes; stipe 8-9 mm, enclosed within the calyx; beak to 3 mm; dehiscence causing valves to twist one-half to three-quarters of a turn. Seeds not seen. Figure 118.

Figure 118. Clitoria simplicifolia. (a) habit, x 1; (b) juvenile leaf, x 1; (c) inflorescence, x 1; (d) calyx, x 1; (e) vexillum, x 1; (f) ala and carina, x 1; (g) androecium, x 1; (h) gynoecium, x 1; (i) legume from cleistogamous flower, x 1; (j) legume, x 1. (Malme 2504, S: a. Philcox, Ferreira, & Bertoldo 3424, K-404: d-h. Harley & Souza 11032, K-403: c. Pires 6780, US 2646236: b, i-j.)



Unifoliate Clitoria is characterized as a subshrub with sessile, broad 1-foliate leaves which are nearly glabrous on both surfaces, medium-sized pale blue to violet flowers, and weakly costate fruits.

PHENOLOGY: Chasmogamous flowers have been collected from March to early December (except in May and August). Cleistogamous flowers bearing fruits have been collected in June.

TYPE COLLECTION: VENEZUELA. Cresit ad ripam fluvium Orinoci, Humboldt & Bonpland (TYPE: P ?-not seen).

Kunth cited the locality data as above, but neglected to cite any collection. Humboldt, Bonpland, and Kunth (1824) repeated Kunth's type locality as cited above omitting the word "ripam" and also neglecting to cite any collection. Bentham (1858) transferred the species to the genus Clitoria, and cited three collections as "ad flum. Orinoco (Humboldt et Bonpland), in Brasiliae prov. Goyaz et Pernambuco (Gardner, n. 2822 et 3669)." Based upon Bentham's citation being in agreement with Kunth's data, the probable type collection was made by Humboldt & Bonpland ca 1799-1804 during their expedition to northern South America along the Orinoco River. Stafleu (1967, p. 223) indicates that the types are deposited at Paris with a duplicate set at Berlin in the Willdenow Herbarium. Examination of microfiches of the Willdenow Herbarium indicated that the genus Neurocarpum is absent, and that no specimen of this species exists under the genus Clitoria.

One specimen of Gardner 2882 (NY) has been examined. It is not in agreement with the description of C. simplicifolia, and in fact, is not a legume, having opposite, simple leaves and bearing tricarpellate fruits with a pubescence of dense, appressed, rufous trichomes. There

must have been a mixup in the labels at some point before mounting these specimens.

Gardner 3669 (K,W) has been examined and is in agreement with the description of the species. This collection would be better as a neotype collection than others because of its frequent citation in the literature for C. simplicifolia, if the probable type collection of Humboldt and Bonpland is not located.

NOTES: In the literature C. simplicifolia is known as the only species with solely 1-foliate leaves borne on the stem. Any specimen with unifoliate leaves thus was identified as C. simplicifolia. However, unifoliate leaves can occur on stems of several species of Clitoria. Asian species have stalked unifoliate leaves which distinguishes them from C. simplicifolia. Clitoria kaessneri is distinguished by its smaller flowers and ecostate, flat fruits. Clitoria simplicifolia has close affinities with C. guianensis and C. densifolia, both of which typically have 3-foliate leaves, but which also rarely bear only 1-foliate leaves on a stem. Clitoria densifolia is distinguished by conspicuously pubescent stem and calyx, narrower unifoliate leaves (when mature), longer calyx tubes and lobes, larger stipules, and the highly elongated bracteoles. Clitoria guianensis is distinguished by the somewhat longer stipules, longer bracteoles, and the elongated unifoliate leaves which are uncinately-pubescent above.

Most collections examined had short internodes which become somewhat hidden by the broadened leaves. A few collections exhibited an elongation of the internodes with the leaves smaller and well spaced.

DISTRIBUTION (Figure 117): This species is collected from marginal habitats along rivers and grasslands from central to western Brazil,



and southern Venezuela. Elevations are commonly lacking in the data, being recorded only once as 100 m.

B R A Z I L. Burchell 8121 (K); valley of Santa Bald, Sep 1829, Gardner 2882 (K); Lagoa de Piquieririo, 30 Sep 95, Glaziou s.n. (P). PARÁ: Ilha do Marajó, Rio Camará, Mar 1950, Lima 83 (US); Ile Marajó, Jutaba, 1 Aug 1902, Huber 2673 (RB); campo coberto de Martins Pinherio, mun. de Marapanim, 20 Jun 1958, Pires 6780 (US); Bran Branco, Rio Tocantins, 31 Dec 1914, Ducke 15579 (RB); Almeirim, 11 Apr 1903, Ducke 3461 (RB-mixed). MATO GROSSO: pr. Cuyaba, 19 Nov 1902, Malme 2504a (S); inter Aricá et Terra da Chapadas, 21 Oct 1902, Malme 2504 (S); Xavantina, 14°38'S-52°14'W, 12 Nov 1968, Harley & Souza 11032 (K); Cachinbo Rd 247.5 km E of Xavantina, 12°49'S-51°46'W, 7 Dec 1967, Philcox, Ferreira, & Bertoldo 3424 (K); Terro do Itapirapuan, 1894, Lindman A3461 (S). GOIAS: 1841, Gardner 3669 (K,W).

V E N E Z U E L A. AMAZONAS: La isla de El Ratón, 100 m, 1 Jun 1940, Williams 13228 (F,VEN).

56. Clitoria flagellaris (Benth.) Benth., Journ. Linn. Soc. 2:

39. 1858.

Neurocarpum flagellare Benth., in Hook. Journ. Bot. 2: 58.

1840.

Suffrutescent herb, erect to 40 cm tall, with prostrate, flagellate branches from near the base. Stem ca 2 mm thick, erect, unbranched except at the base, very weakly flexuous, lignose, juvenile stem densely pubescent, trichomes conspicuous, rufus, erect, ca 1 mm long, becoming whitish, subappressed, moderately spaced; internodes ca 2-3.5 cm

long, nearly straight; adventitious rootlets borne at base of stem; branches prostrate, flagellate, 60-70 cm long, ca 1.5 mm thick, herbaceous, nontwining, pubescence as stem, internodes elongate, 8-11 cm long, nearly straight to weakly arcuate, solid. Leaves 3-foliate, subcoriaceous, leaflets oblong to oblong-lanceolate, apex obtuse, mucronate, base rotund, midrib weakly raised above, primary nerves of 7-9 pairs, upper surface dark green, subvillosus, trichomes rufus, lower surface green, villosus, trichomes rufus, lamina 3-6.5 cm long, 1.2-1.6 cm wide. Petioles longer than rachis, 1-2.5 cm, angular-terete, densely pubescent, trichomes erect, rufus; rachis similar to petiole, 0.3-0.6 cm. Petiolules 2-3 mm, subquadrate, densely pubescent, trichomes rufus. Stipules deltoid-lanceolate, acute, 4-6 mm long, 1.5-2 mm wide, uncinat-pubescent with macrotrichomes prominent toward margins; stipels linear, acute, 2-6 mm long, 0.3-0.8 mm wide, uncinat-pubescent with macrotrichomes toward margins, terminal stipel much shorter than lateral stipels. Inflorescence axillary, solitary, racemose, 1-3 flowered at apex of peduncle; peduncle ca 2-4 cm, rufo tomentose, bearing chasmogamous or cleistogamous flowers at its apex.

CHASMOGAMOUS FLOWERS: Bracteoles lanceolate, acuminate, ca 2-3 mm long. Calyx villosus. Vexillum ca 4-5.5 cm long, purplish, yellowish toward center and base. Legume unknown. CLEISTOGAMOUS FLOWERS: Bracts lanceolate, acute to acuminate, 3 mm long, 1 mm wide, densely pubescent, rufus. Bracteoles lanceolate, acuminate, 5 mm long, 1 mm wide, densely pubescent, trichomes rufus, villosus. Calyx pubescence of uncinat and dense-spreading-ascending, rufus trichomes, tube ca 6 mm long, 1.5 mm wide at the base expanding to 3 mm wide at the throat, lobes ovate, acute, 5 mm long, 1.5 mm wide. Staminal tube ca 0.5 mm long, free

filaments 2 mm; anthers suborbicular, ca 0.5 mm in diameter. Legume as juvenile prominently costate, pubescence of densely uncinat trichomes with conspicuous, dense, rufus trichomes arising from the region around the medial costa; beak 3 mm. Seeds not seen. Figure 119.

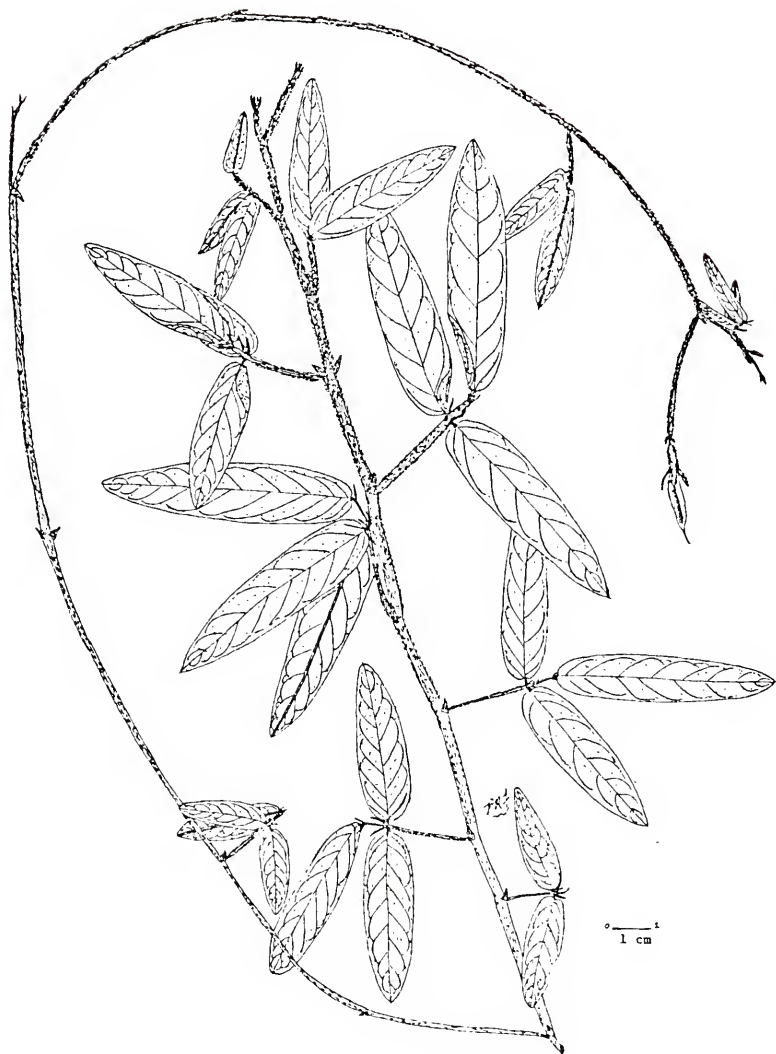
Flagellate Clitoria is characterized as a suffrutescent herb with an erect, rufo-pubescent stem bearing flagellate, rufo-pubescent branches from its base, 3-foliolate leaves having oblong leaflets conspicuously rufo-pubescent on both surfaces, and producing medium-sized, purplish flowers and costate fruits.

PHENOLOGY: The phenology of this species is unknown.

TYPE COLLECTION: BRAZIL. Rio Branco, 1839, Schomburgk s.n.  
(LECTOTYPE: K-20, Hb. Bentham).

Only one specimen of this species has been examined, the lectotype. Bentham cited only one collection with his original publication of the species as "Hab. in Brasiliae boreali, ad Rio Branco: Rob. Schomburgk." The specimen at Kew agrees with the description (except for the chasmogamous flower which is lacking on this specimen) and bears the name Neurocarpum flagellare on the label, and an annotation of "Clitoria flagellaris (Bth.) Bth. Typus speciei." The label has the printed data of British Guiana, with the locality of Rio Branco in ink. This specimen bears one cleistogamous flower near the apex of one of the flagellate branches which Bentham described as apetalous with an abbreviated calyx borne on the lateral branches. The description of the chasmogamous flower presented here is based upon Bentham's description and its comparison with N. ellipticum (= C. falcata).

Figure 119. Clitoria flagellaris. Habit, x 1. (Schomburgk s.n.,  
K-20).



This species has close affinities with C. falcata which is distinguished by the lack of pubescence on the upper leaflet surface, white flowers, and a viney habit.

DISTRIBUTION: This species is known only from the type locality of Rio Banco, Brazil.

57. Clitoria falcata Lam., Encyc. Meth. Bot. 2: 51. 1786.

Clitoria rubiginosa Juss. ex Pers., Syn. Pl. 2: 303. 1807

Neurocarpum ellipticum Desv., Journ. Bot. 1: 119. 1813;

nom. nud.

Neurocarpum ellipticum Desv., Journ. Bot. 3: 75. 1814.

Martia physodes Leandr.-Sac., Denkschr. Akad. Muench. 7:

238, t. 12. 1821.

Martusia physalodes Schult., Mant. 1: 226. 1822.

Clitoria glycinoides DC, Prod. 2: 234. 1825.

Clitoria tetragona Poir. ex DC, l.c. 236. 1825; pro syn.

Neurocarpum falcatum (Lam.) DC, l.c. 236. 1825.

Neurocarpum rubiginosum (Juss. ex Pers.) Desv., in Ham. Prod.

Pl. Ind. Occ. 51. 1825.

Neurocarpum glycinoides (DC) Desv., Ann. Sci. Nat. Ser. 1:

413. 1826.

Neurocarpum villosum Desv., l.c. 413. 1826.

Nauchea falcata (Lam.) Desc., Mem. Soc. Lin. Par. 4: 9. 1826.

Nauchea rubiginosa (Juss. ex Pers.) Desc., l.c. 12. 1826.

Martia brasiliensis Zucc. ex Steud., Nom. ed. 2. 2: 104.

1841; nom. nud.

Neurocarpum argentum Duch. & Walp., Flora 36: 228. 1853.

Clitoria rufescens Benth., Journ. Linn. Soc. 2: 39. 1858.

Ternatea rubiginosa (Juss. ex Pers.) Kuntze, Riv. Gen. Pl. 1:  
210. 1891.

Ternatea glycinoides (DC) Kuntze, l.c. 210. 1891; pro syn.

Clitoria cearensis Huber, Bull. Herb. Boiss. 1: 305. 1901.

Martiusia rubiginosa (Juss. ex Pers.) Britton & Wilson, Sci.  
Surv. Porto Rico 5: 411. 1924.

Crotalaria elliptica Poir., nom. in sched.

Galactia tetragona Poir., nom. in sched.

Clitoria tetragona Poir., nom. in sched.

Clitoria tetragona Vahl., nom. in sched.

Pilanthos tetragonus Poir., nom. in sched.

Rhombolobium ovatum Rich., nom. in sched.

Herbaceous vine, voluble and scandent, occasionally trailing, to 2 m long, sparingly branched, base suffrutescent, suberect. Stem and branches filiform, 2-3 mm thick, longitudinally striate, conspicuously densely pilose-hirsute, trichomes rufus, pubescence becoming less reddish and less dense toward base exposing inconspicuous uncinat trichomes, until glabrous, or rarely glabrescent throughout, pith hollow, inner-nodes near base 1-4 cm long and 6-18 cm long in climbing portions of stem. Leaves 3-foliate, subcoriaceous, petiolate, leaflets variable, oblong, elliptic-oblong to ovate-oblong on smaller leaflets to often oblong-ovate, ovate to elliptic on larger leaflets, apex broadly acute to obtuse to retuse-emarginate, mucronate, base rotund, midrib weakly raised above, primary nerves of 7-9 pairs, upper surface dark green, glabrous, lower surface pale, densely sericeous to thinly sericeous

or subappressed, rarely glabrescent with uncinat trichomes along nerves, smaller leaflets commonly 3.5-7 cm long, 1.5-5 cm wide, to larger leaflets commonly 6-10 cm long, 3.5-6 (8-9) cm wide (Leaflet size is given in two ranges because often only the upper viney part of plant is collected, and larger leaflets often are not collected). Petioles weakly quadrangular to terete, longitudinally striated, 2-6 (8) cm long, often densely pilose-hirsute with rufus trichomes, upper petioles often bent near base abruptly to form an acute to right-angle with the stem; rachis 0.5-2 (2.5) cm. Petiolules dark-colored, quadrangular, 3-5 mm, pubescence of uncinat and dense, rufus, spreading trichomes. Stipules persistent, broadly ovate to elliptic-ovate, broadly acute, 3-6 mm long or rarely 7-9 mm long, 3-4 mm wide, pubescence uncinat and sparsely pilose, ciliate; stipels linear-lanceolate, 3-7 mm long, 0.5-1 mm wide, typically longer than petiolules. Inflorescence axillary, solitary or rarely paired at nodes, racemose, 2- or 4- (6-) flowered, bearing chasmogamous or cleistogamous flowers, rarely chasmocheistogamous.

CHASMOGAMOUS FLOWERS: Peduncle subequal to longer than petiole and rachis, typically 5-15 (20) cm long, pubescence of uncinat and rufus, erect trichomes; rachis 0.5-2 (4) cm. Inner pedicels paired, 2-5 mm. Bracts ovate-lanceolate, acuminate, 3-5 mm long, 1-1.8 mm wide, becoming reflexed with age, pubescence uncinat and pilose-ciliate. Bracteoles lanceolate, ovate-lanceolate, to oblong-lanceolate, acute to acuminate, (6) 7-11 (12) mm long, 3-4 mm wide, pubescence uncinat, pilose, ciliate, bracteoles inserted 0.5-1 mm below calyx. Calyx pubescence inconspicuously uncinat, denser toward base, and conspicuously pilose, 10-nerved, tube 10-20 cm long, 3-6 mm wide at base expanding to 5-10 mm wide at the throat, lobes ovate-lanceolate, long-acuminate, ciliate,



9-15 mm long, 2-4 mm wide near base, ventral lobe 12-16 mm, or occasionally lobes oblong, abruptly obtuse and apiculate, 4-7 mm wide. Vexillum white to white with peripheral tinge of lilac, dark red to purple veins within, blade becoming pale yellow to orange with age, blade glabrate with sparse, appressed trichomes near complicate margin and scattered uncinatate trichomes, blade typically 3.5-5.5 (6) cm long, to occasionally 6-7.5 cm long, typically 3-4 cm wide, claw 4-6 mm. Alae extended beyond carina 5-8 mm, blade 14-23 mm long, 4-8 mm wide, claw 8-15 mm. Carina falcate, 6-10 (15) mm long, 3-5 mm wide, claw 14-25 mm. Staminal tube 20-30 mm, incurved at apex, free filaments 1-3 mm; anthers 1-1.3 mm long, 0.5-0.8 mm wide. Gynophore 4-5 mm; ovary 5-8 mm long, 0.7-1 mm wide, costate, densely white, appressed pubescent; style 14-19 mm, geniculate 5-8 mm from the distal end; stigma capitate, ca 0.5 mm in diameter. Legume stipitate, green to brown, nearly linear to subfalcate toward apex, valves convex, costate or rarely ecostate, 3.5-6 cm long, 7-11 mm wide, pubescence uncinatate with occasional spreading trichomes; stipe 7-11 mm, enclosed within calyx tube along with base of legume; costa prominently formed and extending nearly the entire length of the valve, or sometimes imperfectly formed and extending one-third to two-thirds of the length of the valve, or rarely ecostate; valves at maturity becoming turgid, subtetragonous, dehiscence causing valves to twist one-quarter to three-quarters of a turn; beak to 15 mm. Seeds globose, dark reddish-brown to black, viscid, 4-5 mm long, 4-5 mm wide, ca 3-4 mm thick; 4-9 seeds per pod. CLEISTOGAMOUS FLOWERS: Peduncles 2-10 (14) cm long, rachis 1-6 mm. Bracts 3-4 mm long, 0.5-1.5 mm wide. Bracteoles 4-7 mm long, 1.3-2 mm wide. Corolla lacking, rarely observed, vestigial petals ca 1 mm long. Calyx

tube 5-7 mm long, 1.5-2 mm wide at base expanding to 2-4 mm wide at the throat, lobes 4-7 mm long. Staminal tube ca 0.5 mm long, free filaments 3-4 mm. Gynophore 1 mm; ovary 5 mm long, costate, densely pubescent, trichomes white, style 3-4 mm, bent abruptly back upon ovary. Legume as fruit from chasmogamous flower, smaller, 2.5-4.5 cm long, 7-11 mm wide, stipe 6-12 mm, often strongly curved. Figures 121, 124, and 125.

Rubiginose Clitoria can be characterized as a herbaceous vine with filiform, voluble, densely rofo-pilose stems, petiolate 3-foliate leaves, and bearing white flowers or costate fruits from axillary peduncles.

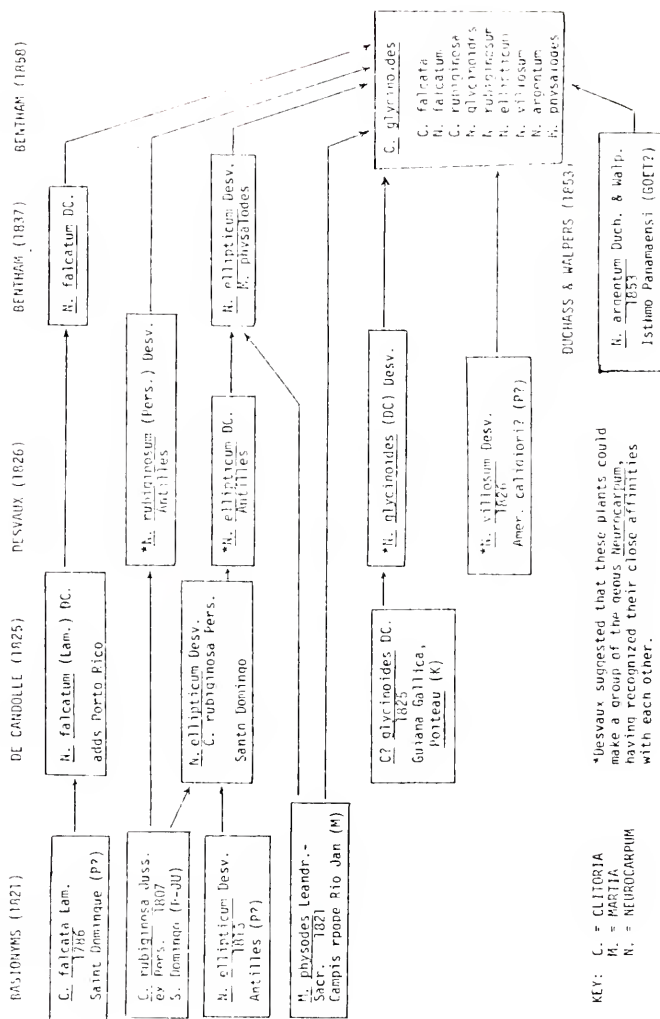
PHENOLOGY: Chasmogamous flowers have been collected in every month but January, with a larger percentage of collections occurring from May to November, and fewer collections made in December, and February to April. Fruits from chasmogamous flowers are rarely collected, and are known in February and March, and July to November. Cleistogamous flowers and its associated fruits are commonly collected in every month of the year with fewer collections made during the months of January, April, July, and October.

TYPE COLLECTION: dans les bois, Sant-Domingue (P-hb. Jussieu, not seen).

This species is generally known by one of two names, either C. glycinoides DC. or C. rubiginosa Juss. Either name is often cited as the synonym of the other in various botanical works, usually with older works following Bentham (1858) and using the name C. glycinoides, whereas more recent works use the name C. rubiginosa, apparently following Fawcett and Rendle (1920). Clitoria falcata is infrequently cited as a synonym, although by priority, it appears to be the legitimate name for the species.

Bentham's revisionary treatment (1858) is the source for the adoption by later botanists of the name C. glycinoides. Bentham included a number of names in synonymy under C. glycinoides, most of which have disappeared in the literature, including C. falcata. Figure 120 illustrates the history of those names cited in synonymy under C. glycinoides and their application by those earlier workers whom Bentham cited. Several names were published prior to the name adopted by Bentham, including C. falcata (1786), C. rubiginosa Juss. ex Pers. (1807), Neurocarpum ellipticum Desv. (1814), and Martia physodes (1821).

Although this author has not seen the Paris types of C. falcata, C. rubiginosa, or N. ellipticum, he has examined the types of C. glycinoides (K) and M. physodes (M), as well as examined other cited specimens which indirectly reflect those type specimens not seen. De Candolle placed C. rubiginosa as a synonym under N. ellipticum. Bentham (1837) followed the treatment of De Candolle and cited one collection as "In campis editis montis Itacolumi prope Villa Rica provinciae Minais Gerais, Martius" (M 12426! 12427!) which agrees with the type of C. glycinoides and annotated with that name. Under N. falcatum, Bentham cited one collection as "In sepibus ad fluvium Japura, et ad Coari provinciae Rio Negro, Martius" (M 12423! 12424! 12425!) which agrees with the type of C. glycinoides and annotated with that name. Additional material was examined from the localities cited for the types and from the distribution included by Bentham. All plants bearing on this group of names, including the less frequently used C. falcata, N. falcatum, and N. ellipticum for older specimens, except for gross misidentifications, agree with the type of C. glycinoides and the cited specimens examined. The only other herbaceous vine of



Clitoria with a range that includes the type locality of C. falcata is C. ternatea distinguished by the larger number of leaflets and flat, ecostate fruits.

Bentham (1858) cited C. falcata Lam. as a synonym of C. glycinoides with the footnote "Lamarck's description of the fruit does not agree with that of this species, but de Candolle, who saw the original specimen in the Jussieu herbarium had certainly this plant in view. If the identity is confirmed, Lamarck's specific name should be adopted." Lamarck described the fruit as long straight pods, compressed, falcate, with many articulations. De Candolle, having examined the original specimen in Jussieu's herbarium, described the fruit as subfalcate with a median nerve on the valve. Costate fruits are rare in the Leguminosae. Fruits of members of section Neurocarpum of the genus Clitoria are noted for the unique nerve in the middle of the legume valve, whereas Centrosema has two nerves, one near each margin, and Canavalia has one nerve on some fruits, but located near the margin, not medially.

When this species is viewed as a whole, discrepancies in the various descriptions become less apparent. Fruits are usually costate, straight to subfalcate, compressed as a juvenile, becoming turgid around the seeds and then turgid between the seeds to form a subtetragonous fruit. The valves are marked with numerous oblique striulations. Fruits may have imperfectly formed costas or be ecostate, as illustrated by Faris 597 (US) which bears legumes from cleistogamous fruits, one of which possesses a longitudinal nerve, one of which is ecostate, and a detached fruit bearing a costa only in the distal half of the valve. Other structures agree with descriptions published by Lamarck, Bentham, and de Candolle. The inflorescence is long-pedunculate,

often exceeding the leaves on the twining portions of the stem. Pubescence is variable with juvenile stems densely rubiginose, becoming less rufus and nearly glabrous with age. Peduncles typically bear 1 to 2 nodes of paired flowers, with the lower node often only 1-flowered, giving the "subtrifloris" appearance often described. Flowers are commonly white with sometimes a peripheral lilac tinge, and usually dark purplish veins, a pattern which has led a few collectors to note the flowers as "purplish."

With the exception of the slight discrepancies in the descriptions, the author of the present study has been unable to find any evidence that C. falcata Lam. should be segregated from this species. Based upon the literature, cited specimens bearing this name, and the consistent inclusion of C. falcata in synonymy, the evidence shows that Lamarck's name has always been associated within the concept of this species, as described by Bentham in 1858. As the oldest legitimate name, priority indicates that C. falcata should be adopted for this species.

VERNACULAR NAMES: BRAZIL (SÃO PAULO): Espelina Falsa, Toledo 2664. ECUADOR (AZUAY): Muzgil, Steyermark 52874.

ECONOMIC IMPORTANCE: This species is reported as a good cover crop (Schipp 573, Belize) and used as a forage plant (Toledo 2664, São Paulo, Brazil).

NOTES: Clitoria falcata has close affinities with C. flagellaris which is distinguished easily by the narrow oblong leaflets which are conspicuously pubescent on both surfaces, the purple flowers, and the flagellate, prostrate branches from the nontwining stem. A variety in southern Brazil has characteristically larger flowers than those of the

typical variety. Variety aurantiaca appears to have close similarities with C. densiflora which is distinguished by its erect habit, larger bracteoles and stipules, and usually broader, subsessile leaves with the occasional production of 1-foliate leaves. This variety appears to be somewhat intermediate between most individuals of C. falcata and individuals of C. densiflora.

KEY TO VARIETIES AND FORMS:

1. Calyx (chasmogamous and cleistogamous flowers) conspicuously pilose-hirsute, and inconspicuously uncinat-pubescent; legume costate (rarely ecostate or with imperfectly formed costa, a mixture of types on one plant usually); leaflets densely pubescent on lower surface, then becoming thinned with age; juvenile portion of stem conspicuously pubescent, trichomes dense, erect, rufus, becoming thinned with age, whitish, and subappressed, lower stem portions glabrate to inconspicuously pubescent.
2. Flowers medium-sized, 3.5-5.5 (6) cm, pale yellow into deep yellow in dried state; calyx tube 10-16 mm long, moderately to densely pilose; calyx lobes ovate-lanceolate, 2.5-4 mm wide; bracteoles ovate-lanceolate, acute, base cuneate.
3. Bracteoles 6-11 mm long, 3-4 mm wide; larger leaflets narrow, 3-5.5 (6) cm wide (Neotropics, W Africa) . . .  
 . . . . . 57a. var. falcata
4. Inflorescence bearing flowers close together, first internode of rachis commonly 0.5-2 cm long.
5. Stipules and stipels 3-6 (7) mm long.

6. Legume with prominently raised nerve extending the length of the valves; common . . . . .  
 . . . . . 57aa. f. falcata
6. Legume with medial nerve imperfectly formed, extending one-third to two-thirds the length of the valve, rarely extending nearly the entire length and weakly raised, or ecostate (often various types on one individual); infrequent .  
 . . . . . 57ab. f. heteromorpha
5. Stipules and stipels 7-10 mm long (rare) . . . . .  
 . . . . . 57ac. f. stipulacea
4. Inflorescence bearing flowers well separated, first internode of rachis 4-5 cm long (rare) . . . . .  
 . . . . . 57ad. f. longirachis
3. Bracteoles 10-15 mm long, 4-6 mm wide; larger leaflets broad, 5-8 cm wide (Brazil). . . . . 57b. var. latifolia
2. Flowers large, (5.5) 6-7.5 cm long, dark yellowish-orange to orange in dried state; calyx tube 16-20 mm long, lax pilose with pubescence confined primarily to ventral and dorsal portions; calyx lobes oblong, 4-7 mm wide, abruptly acuminate; bracteoles oblong, obtuse, base attenuate, abruptly widening above middle (S. Brazil). . . . . 57c. var. aurantiaca
1. Calyx (chasmogamous and cleistogamous flowers) glabrate with inconspicuous uncinat-pubescence; legume ecostate; leaflets glabrescent to glabrous on lower surface; juvenile portion of stem glabrescent to glabrate (Africa, Tobago) . . 57d. var. glabrescens



57a. Clitoria falcata Lam. var. falcata

Stem with upper portion conspicuously pubescent, trichomes dense, erect, rufus. Leaves conspicuously pubescent on the lower surface, leaflets commonly 3-5.5 (6) cm wide on the larger leaflets. Flowers 3.5-5.5 (6) cm long, vexillum becoming pale yellow to deeply yellow in the dried state. Calyx tube 10-16 mm long, moderately to densely pilose, lobes ovate-lanceolate, 2.5-4 mm wide. Bracteoles ovate-lanceolate, acute, base cuneate to broadly cuneate. Figures 121 and 124.

DISTRIBUTION (Figures 111, 122, and 123): The typical variety is found in the neotropics and west Africa on sandy soil or occasionally clay in open pine-oak forests, grasslands, and savannas, or occasionally in thickets. It is noted to occur in cut-over forest areas, and becomes somewhat weedy in city lots. This species has been collected at altitudes of 50-1200 m.

57aa. Clitoria falcata Lam. var. falcata f. falcata

Clitoria rubiginosa Juss. ex Pers., Syn. Pl. 2: 303. 1807.

Neurocarpum ellipticum Desv., Journ. Bot. 1: 119. 1813;

nom. nud.

Neurocarpum ellipticum Desv., Journ. Bot. 3: 75. 1814

Martia physodes Leandr.-Sacr., Denkschr. Akad. Muench.

7: 238, t. 12. 1821.

Martusia physalodes Schult., Mant. 1: 226. 1822.

Clitoria glycinoides DC, Prod. 2: 234. 1825.

Clitoria tetragona Poir. ex DC, l.c. 236. 1825; pro syn.

Neurocarpum falcatum (Lam.) DC, l.c. 236. 1825.

Neurocarpum rubiginosum (Juss. ex Pers.) Desv., in Ham.

Prod. Pl. Ind. Occ. 51. 1825.

Neurocarpum glycinoides (DC.) Desv., Ann. Sci. Nat. Ser. 1:

413. 1826.

Neurocarpum villosum Desv., l.c. 413. 1826

Nauchea falcata (Lam.) Desc., Mem. Soc. Lin. Par. 4: 9.

1826.

Nauchea rubiginosa (Juss. ex Pers.) Desc., l.c. 12. 1826.

Martia brasiliensis Zucc. ex Steud., Nom. ed. 2. 2: 104.

1841; nom. nud.

Neurocarpum argentum Duch. & Walp., Flora 36: 228. 1853.

Ternatea rubiginosa (Juss. ex Pers.) Kuntze, Riv. Gen. Pl.

1: 210. 1891.

Ternatea glycinoides (DC.) Kuntze, l.c. 210. 1891; pro syn.

Clitoria cearansis Huber, Bull. Herb. Boiss. 1: 305. 1901.

Clitoria glycinoides DC. var. guaranitica Chod. & Hass.,

Bull. Hern. Boiss. 4: 895. 1904.

Martiusia rubiginosa (Juss. ex Pers.) Britton & Wilson,

Sci. Surv. Porto Rico 5: 411. 1924.

Clitoria rubiginosa Juss. var. genuis Stehlé & Quentin,

Fl. Guad. 2(fas. 2): 106. 1948; nom. nud.

Crotalaria elliptica Poir., nom. in sched.

Galactia tetragona Poir., nom. in sched.

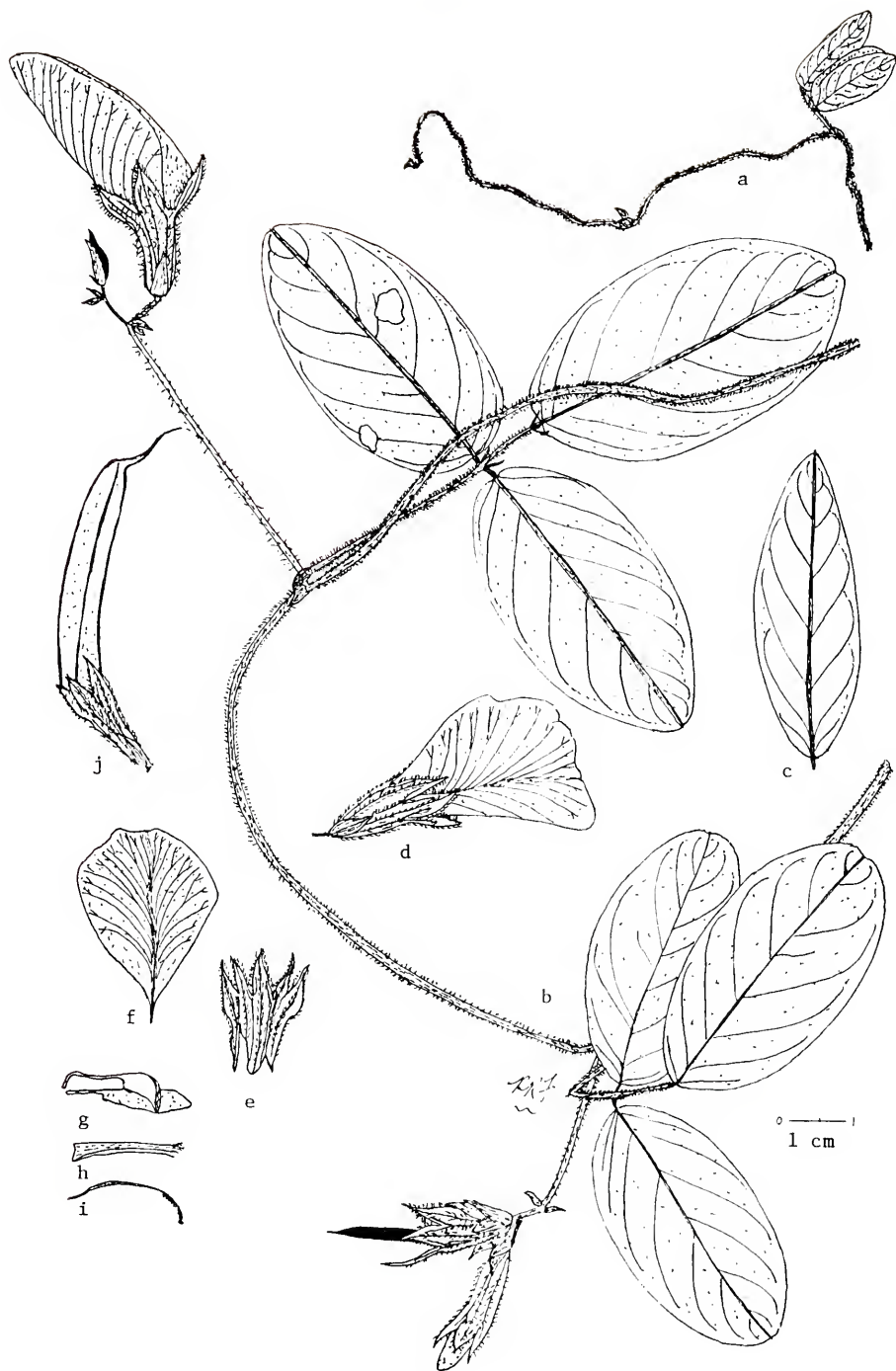
Clitoria tetragona Poir., nom. in sched.

Clitoria tetragona Vahl., nom. in sched.

Pilanthos tetragonus Poir., nom. in sched.

Rhombolobium ovatum Rich., nom. in sched.

Figure 121. Clitoria falcata - I. Var. falcata f. falcata: (a-b) upper portion of stem, x 1; (c) leaflet, x 1; (d) flower, x 1; (e) calyx, x 1; (f) vexillum, x 1; (g) ala and carina, x 1; (h) androecium, x 1; (i) gynoecium, x 1; (j) juvenile fruit from chasmogamous flower, x 1. (Pittier 13615, VEN 4043: a,c,e-i. Dwyer 7155, GH: b. Hayes 798, NY: d,j.)



Stipules and stipels 3-6 (7) mm long. Inflorescence with flowers close together at apex of peduncle, first internode commonly 0.5-2 cm long. Legume with costa prominently raised, extending nearly the entire length of the valve. Figures 121 and 124.

DISTRIBUTION (Figures 111, 122, and 123): The typical form is common in the neotropics and introduced into western Africa.

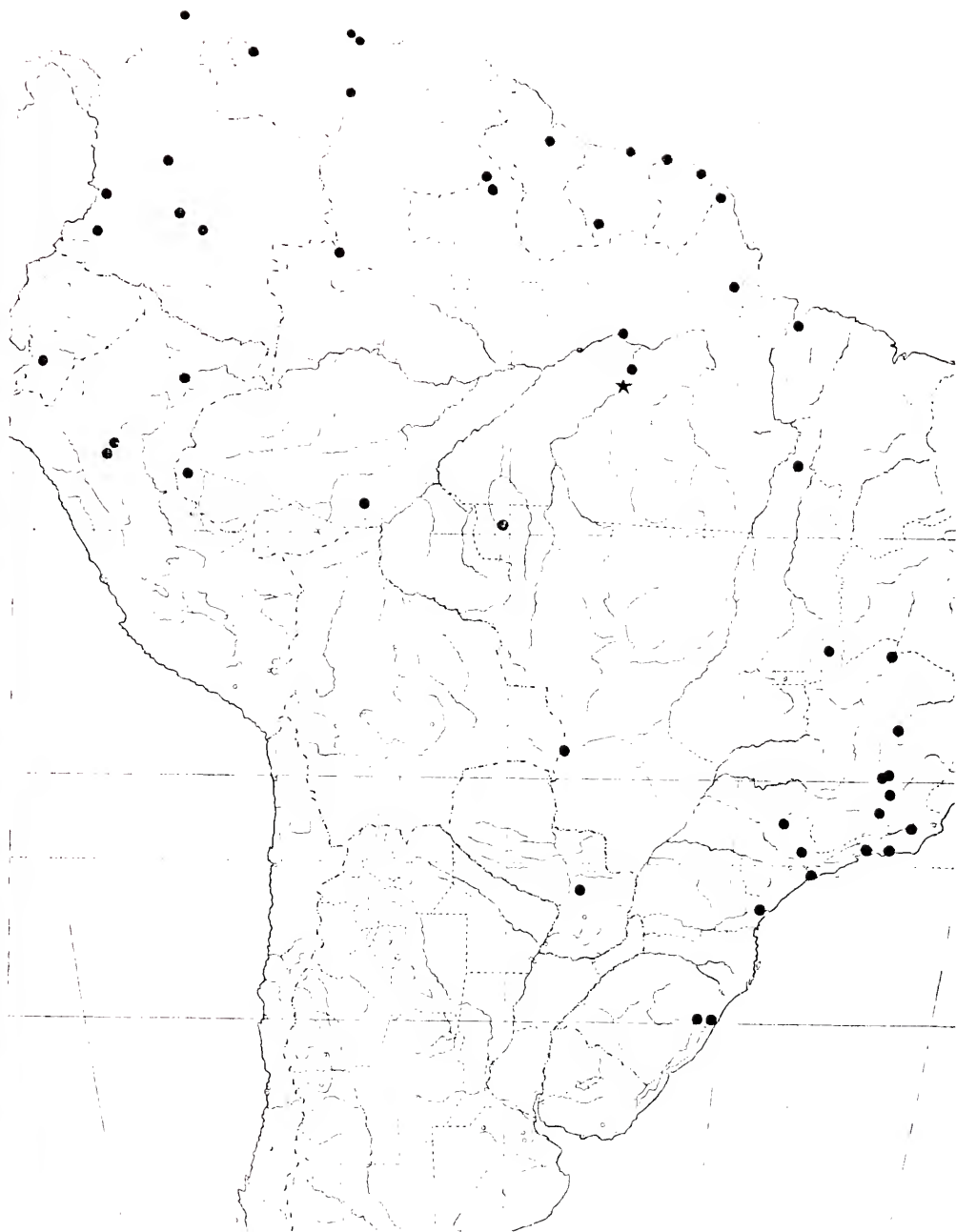
L O C A L I T Y U N K N O W N. Baudin s.n. (P); hb. Jussieu s.n. (P); Richard s.n. (G); Anonymous s.n. (E,G); de Candolle s.n. (G); Capacabana, 23 Jan 1879, Schwacke 1576 (RB); Obispo Sta., Oct 1841, Hayes 312 (BM).

#### S O U T H A M E R I C A

P A R A G U A Y. SAN PEDRO: vic. San Estanislao, Jan 1899, Hassler 5986 (type synonym C. glycinoides var. guaranitica: G-2 sh.); Entancia Prinern, Jan 1882, Jorgensen 4832 (A,S); Primavera, 3 Mar 1960, Woolston 1191 (NY,S,U,UC); l.c., 1953-1961, Woolston 1280 (NY-frag.).

B R A Z I L. RIO GRANDE DO SUL: S. Leópolis, 17 Dec 1948, Rambo 38877 (F,W); Fazenda do Arroio, prope Osorio, 4 Jan 1950, Rambo 45108 (F,W). PARANÁ: Cacata, mun. Antonina, 18 Feb 1967, Hatschbach 16008 (MICH,NY,UC,US). SÃO PAULO: 1840-46, Perdonnet 213 (G-mixed); Campinas, 13 Nov 1904, Heiner 323 (S); l.c., 30 Dec 1918, Toledo 2664 (NY); l.c., 3 Apr 1936, Santoro 432 (US); Nova Campinas, suburb Campinas, 11 Apr 1964, Norris 136 (NY); mun. Matão, ca 10 km S. Matão, near Porto Cambuhy, 18 Feb 1964, Norris 40 (NY); Santos, 20 Feb 1875, Mosén 3358 (S-3 sh.). RIO DE JANEIRO AND GUANABARA: Rio Janeiro, Widgren s.n. (S); l.c., 1844, Widgren s.n. (S-2 sh.); l.c., Mertens s.n. (A); l.c., DeKay s.n. (E); l.c., Dec 1831, Riedel 132 (BM,E,GH,W) and Dec 1832, Riedel 132 (M,S-s sh.,W); prope Rio de Janeiro, Martius s.n.

Figure 122. South American distribution of *Clitoria falcata*, section *Neurocarpum*. *C. falcata* var. *falcata* f. *falcata* (●); var. *latifolia* (★).



(M); Angra dos Reis, 2 Mar 1965, Lanna 863 & Castellanos 25592 (US); Cantagalo, Peckolt 41 (W) and 217 (NY,W). MINAS GERAIS: received Mar 1839, Claussen s.n. (G); Aug-Apr 1840, Claussen s.n. (BM); Capanema s.n. (Holotype of synonym, C. rubiginosa f. longifolia: RB-2 sh.); Manga, mun. C. Verde, 19 Jan 1944, Macedo 207 (US); Vicosá, road to Barrosa, ca 2.5 km Hedgerow, 690 m, Mar 1930, Mexia 4449 (BM-mixed, GH,MO,NY,S,UC); Fazenda de Chicaca, mun. Santa Luzia, 1100 m, 13 Dec 1945, Assis 234 (UC,US); Belo Horizonte, 1000 m, 12 Mar 1945, Williams & Assis 5944 (GH); l.c., Vila Bicário, 11 Jun 1945, Williams & Assis 7219 (GH); near Lagoa Pampulha, mun. Belo Horizonte, 1000 m, 8 Mar 1945, Williams 6068 (GH); Belo Horizonte, Ressaça, 20 Feb 1936, Barreto 5804 (F-mixed); Jardim Botânico Belo Horizonte, 7 Feb 1934, Barreto 102 (F); Campis editis Mantis Stacolumi prope V. Asia, Martius s.n. (M); M Sta. colueci prope N.R., Martius 933 (M); Universidade Rural de Minas Gerais, Vicosá, 18 Feb 36, Kuhlman 3936 (US); Rio Jequití, ca 25 km E of Diamantina, 790 m, 17 Mar 1970, Irwin et al. 27785 (NY); ad Lagoa Sta., Warming s.n. (F,CH-mixed); l.c., Warming 19 (MO-2 sh.); l.c., Warming 2036 (G). BAHIA: Blanchet 160 (BM,G-3 sh.) and 385 (G). CEARÁ: Barrado Jardim, Dec 1838, hb. Gardner s.n. (BM); GOIÁS: Serra do Morcêgo, Córrego Estrena, 35 km NW Formosa, 800 m, 18 Apr 1966, Irwin et al. 14966 (GH,NY,S,US); ca 5 km N of Araguaína, 300 m, 14 Mar 1968, Irwin, Maxwell, & Wasshausen 21151 (MO,NY,US). MATO GROSSO: Santa Cruz da Barra, 25 Mar 1894, Lindemann A3165 (S-2 sh.); Cuyabao ad Rio Ceirao, 23 Jun 1902, Malme 2141B (S); Cuyaba, 23 Apr 1903, Malme 2141B (S); Corumba, fl. Paraguay, 21 Jul 1903, Malme 2141C (S-2 sh.). AMAPÁ: Road to Amapá, km 48, 10 Jul 1962, Pires & Cavalcante 52035 (NY,US); Rio Macacoarí, mun. de Macapá, 5 Jul 1951, Froés & Black 27224 (NY);



Cachoeira Grande Roche, Rio Oiapoque, 3°48'N-51°53'W, 24 Jul 1960, Irwin, Egler, & Pires 41739 (NY). PARÁ: Obidos, 12-8-1916, Ducke 16337 (BM); Boa Vista on Tapajós River, May-Jun 1929, Dahlgren & Sella 63 (F) and 90 (F); Belém, 8 Nov 1896, Huber 107 (G-mixed); l.c., Mar-May 1929, Dahlgren & Sella 420 (F) and 551 (F) and 640 (F) and 707 (F) and 773 (F); l.c., 4 Nov 1945, Pires & Black 545 (GH); l.c., 5 Apr 1947, Pires & Black 1567 (NY,RB). RIO BRANCO: Surumu, Sep 1909, Ule 8179 (G-2 sh.,UC). AMAZONAS: campo Marajozinko, 4 Apr 1945, Ducke 2058 (U); Rio Ituxi, Boca do Curuquete, Capoeira, 11 Jul 1971, Prance et al. 14180 (NY,U); Rio Negro, fl. Japura, Martius s.n. (M); São Felipe, upper Rio Negro, 25 Feb 1944, Baldwin Jr. 3472 (US); Rio Negro ad Coari, Martius s.n. (M-2 sh.); Rio Negro, prope San Gabriel de Cachoeira, Jan-Aug 1852, Spruce 2158 (BM,E,F,G-2 sh.,GH,M,NY,W). ACRE: Rio Moa, 10 km above & below Maita, 16 Apr 1971, Prance et al. 11994 (GH,M,NY,S).

F R E N C H G U Y A N A. Leprieur s.n. (P): Leprieur 1840 (G); hb. Mustin (S); Feb 1824, Poiteau s.n. (type of synonym, C. glycinoides: K,S=photo of K); vic. Cayenne, 11 May 1921, Broadway 157 (GH,NY); l.c., 23 May 1921, Broadway 266 (GH,NY); Cayenne, Van Rohr s.n. (BM); Mana, 1855, Sagot 119 (BM,W).

S U R I N A M. 19 Sep 1933, Lanjouw 887 (U,US); Sandrij I., 14-25 Nov 1934, Archer 2848 (U,US). SURINAME: Paramaribo, Wulfschlagel 92 (NY,W). SARAMACCA: Voltsberg, fluv. Copperone, 22 Aug 1920, Pulle 256 (U); fluv. Tapanahoni, Nov 1904, Versteg 833 (U); Borend, Mar 1829, Forte 1311 (U); Zuid River, 3.5 km E. Kayser Airstrip, 45 km above confluence with Lucie R., 3 10-20"N - 56 29-49"W, 270 m, 28 Aug 1963, Irwin et al. 55269 (NY,U).

G U Y A N A (BRITISH GUIANA): ESSEQUIBO: Rockstone, 15 Jul-1 Aug 1921, Gleason 536 (GH,NY); Lamaba Dam, Apr 1887, Jenman 3682 (BM,NY); Lamamba Canal, Jun 1887, Jenman 3942 (NY); l.c., Jun 1887, Jenman 3943 (NY); San Rupununi R., Sep 1948, Forest Dept. Br. Guiana WB52 (NY).

V E N E Z U E L A. Ginés 100 (VEN); El Sitio Cortada de El Guayabo, 1950, Moldolfi s.n. (VEN-2 sh.); Los Mariches, 21 Aug 1927, Pittier 12444 (G,NY,VEN). APURE: BAP ranch, at "Bucara Crossing" along river to Caudelaria, 7 Feb 1945, Rudd 558 (VEN). MIRANDA: alrededores de Baruta, 1000-1500 m, 21 Oct 1966, Agostini 680 (NY,VEN); La Trinidad, Baruta, Jun 1958, Aristequieta 3205 (VEN); alrededores de El Hatillo, 1400 m, Sep 1960, Aristequieta 4387 (VEN); El Hatillo, 12 Feb 1940, Tamayo 2596 (VEN); Sebastopol, 13 Oct 1938, Badillo 116 (VEN-2 sh.); La Providencia, 1200 m, 22 Oct 1935, Pittier 13615 (VEN), entre Turmerito & Ocumare, 1000 m, 15 Oct 1949, Williams 12445 (F-2 sh.,MICH). DTO. FEDERAL: Caracas, vonte do Aug, Oct 46, Anonymous 418 (S); Caracas-La Fejues, 1 Mar 1940, Tamayo, Chase, & Luces 1164 (VEN). GUARICO: via Cazorla, sabanas al sur de Calabozo, Sep 1962, Tamayo 4594 (US,VEN). BOLIVAR: de campo de Dr. Fernández Feña, Sta. Elena-Gran Sabana, 23 Mar 1946, Tamayo 3185 (VEN). ZULIA: Mene Grande, 2 Nov 1922, Pittier 10641 (G,GH,NY,VEN).

P E R U. Peruviae orientale ad Mission Tocache, Jun 1830, Anonymous D1872 (W). LORETO: Iquitos, 120 m, 27 Mar 1930, Williams 8000 (F); l.c., 31 Jun 1972, Croat 17461 (MO); Mishuyacu, near Iquitos, 100 m, Feb-Mar 1930, Klug 1056 (F,NY); l.c., Apr 1930, Klug 1189 (F, NY); Monfinfa on the upper Rio Nonay, 30 Jun 1929, Williams 1137 (F). SAN MARTIN: Tarapoto, 1835, Mathews 1583 (E-2 sh.); Saposoa, 500 m,

20 Apr 1962, Woytkowski 7238 (GH,UC); 9 Feb 1947, 830 m, Woytkowski 35038 (UC).

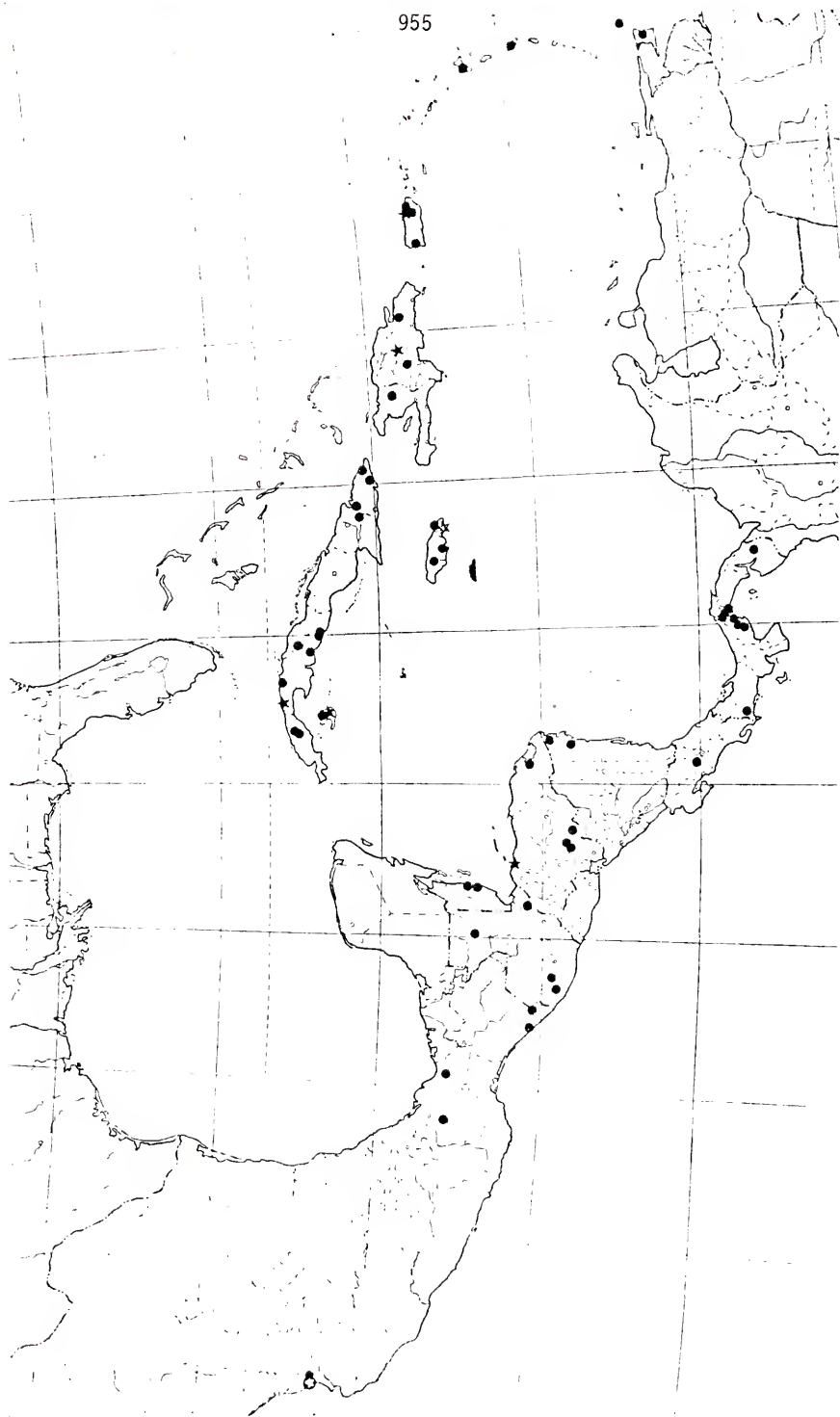
E C U A D O R. AZUAY: between Río Gamolotal & Río Norcay, 1095-1370 m, 7 Jun 1943, Steyermark 52874 (F,MO).

C O L O M B I A. AMAZONAS: N. Leticia, 100 m, 6 Apr 1944, Hermann 11293 (NY). VAUPÉS: Río Guaviare, San José del Guavaire, 240 m, 11 Nov 1939, Cuatrecasas 7653 (F,US). META: El Mico Airstrip, camp 1, last savanna before Rio Guejar, 450 m, 6 Nov 1949, Philipson, Idrobo, & Fernandez 1327 (BM). BOYACA: 100 mi NW of Bogota, 3000 ft, 5 Aug 1932, Lawrence 389 (A,NY,S). CAUCA: Rio Patia, 1100 m, 16 Sep 1938, Sneidern 2313 (S). VALLE: Rio Dagua, 0-500 m, 12 Mar 1885, Lehmann 70a (BM,G); Rio Dagua & Los Quntas, 300-600 m, Lehmann 7796 (F). MAGDALENA: Santa Marta, road from Bonda to Caeagualito, 1500 ft, 10 Nov 1898, Smith 288 (BM,E,F,G-2 sh.,GH,MICH,MO,NY,PENN,PH,S,U,UC-2 sh.,US,WIS); Donama, 500 m, 1932, Giacometto 14 (US); La Jugua, Magdalena Valley, 2 Sep 1924, Allen 632 (MO); Poponte, Magdalena Valley, 8 Dec 1924, Allen 829 (MO).

#### C E N T R A L   A M E R I C A

P A N A M A. 1850, Halstead s.n. (NY); Cumino de las sabanas, Oct 1921, Heriberto 160 (NY); 11 Nov 1917, Killip 3246 (US). COCLE: W Río Guías, 10 Sep 1972, Gentry 5837 (MO); 4 mi W Anton on Rio Chico, 8 Dec 1965, Tyson & Blum 2599 (MO). CANAL ZONE: Ancon Hill, 26 Nov-9 Dec 1923, Standley 25204 (MO,US); Ancon, road to Corozal, 18 Nov 1912, Celestine 37 (US); Corozal, 25 Nov 1917, Killip 3255 (US); Curundu, survival school area, 27 Sep 1965, Tyson 1302 (MO); E of Curundu, 2 Dec 45, Harvey 5193 (F) and 5195 (F); Paraiso Sta. P.R.R., 1 Dec 1859, Hayes 173 (GH-2 sh.) and 798 (NY-2 sh.); Paraiso, 29 Nov 1966, Dwyer

Figure 123. Caribbean American distribution of Clitoria falcata, section Neurocarpum. C. falcata var. falcata f. falcata (●), f. heteromorpha (★), f. longirachis (⊕), f. stipulacea (☆).



7155 (GH,MO); Rio Pedro Miquel near E Paraiso, 7 Jan 1924, Standley  
30039 (US); near Madden Wye, 17 Nov 1970, Croat 12617 (MO); Howard Air  
 Force Base near Red Devil Drop Zone, 24 Oct 1965, Tyson 1867 (MO);  
 Balboa, Nov 1923-Jan 1924, Standley 25416 (MO,US) and 26062 (US);  
 R. Azote, Caballo, 66-70 m, 7 Dec 1934, Dodge, Steyermark, & Allen  
16821 (GH,MO-2 sh.); C2 E of Fort Clayton, 17 Nov 45, Harvey 5102 (F);  
 Road C-21, 3 Oct 1962, Duke 5772 (GH,MO); Road C-21 near Police Lodge,  
 1 Jan 1971, Croat 12984 (MO); Road K5-16, 15 Oct 1966, Duke 8970 (MO);  
 Barro Colorado Island, shore N of Zetek House, 25 Feb 1932, Woodworth &  
Vestal 693 (A,MO); San Jose Isl., East Harbor, 1 Oct 1945, Harlow 84  
 (GH); l.c. isl., East Bay, 16 Oct 1944, Johnston 195 (BM,GH). PANAMÁ:  
 Near El Valle, 350 m, 3 Mar 1971, Burt & Rattray 32 (MO); near La  
 Chorrera, between Balboa & Chamé, 2 Dec 1934, Dodge et al. 16739 (GH,  
 MO); Tocumen, near radar tower on Ag. Farm, 9-3-1963, Dwyer 2993 (MO-  
 2 sh.); along Corozal road, near Panama, 13 Dec 1923, Standley 26803  
 (US); Tumba Muerto Rd near Panama, 6 Jan 1924, Standley 29791 (US);  
 between Matías Hernández & Juan Díaz, 21 Jan 1924, Standley 32066 (US);  
 Camino a Chepo en el centro de Instrucción Militar, Taylor 125 (MO).  
 CHIRIQUI: near Concepcion, 100-200 m, 17 Mar 1971, Burt & Koster 142  
 (MO); David Airport, 25 ft, 14 Dec 1966, Lewis et al. 765 (GH,MO).

C O S T A R I C A. Oct 1943, Fernandez s.n. (NY); savannas de  
 Boruca, Dec 1891, Pittier 4713 (G). SAN JOSÉ: El General, 730 m, Nov  
 1936, Skutch 2951 (GH,MO,US).

N I C A R A G U A. Atlantic coast, old campsite Wilder's Switch,  
 100 m, 3 Oct 64, Sluijs 625 (F); Bihmonia, 7 Jul 1962, Seymour 5718  
 (Seymour herb.); Puerto Cabezas, 10 Jan 1964, MacKee 11236 (P).

H O N D U R A S. MORAZÁN: near Jicarito, drainage Rio Yeguaré, 87°W-14°N, 900 m, 7 Aug 1949, Williams & Molina 15885 (F,GH); San Antonio de Oriente, 900 m, 8 Sep 1943, Rodriguez 673 (F) and 677 (F); San Antonio, 900 m, 3 Nov 1941, Rodriguez 1469 (F); vic. El Zamorano, 780-900 m, 26 Nov 1946-9 Jan 1947, Standley 167 (F); l.c., 800 m, 21 Sep 1948, Standley 12542 (F); mt slope along Rio Agua Amarilla NW El Zamorano, 1100-1200 m, Standley 22875 (F); El Quebrado, above El Zamorano, 950 m, 29 Nov 1946, Standley 319 (F); aqua abajo de la Quebrada El Callo N of Zamorano, Rio Yequare drainage, 87°W-14°N, 12 Aug 1949, Molina 2596 (F); area rocosa entre Agua Amarilla y Piedras Gordas, 1300 m, Rio Yequare drainage, 14°N-87°W, 2 Nov 1948, Molina 1391 (F,GH). LA MOSQUITA: dept. Gracias a Dios, Ahuas, 84°20'W-15°30'N, 12-14 Dec 1972, Clewell 3536 (MO). CHOLUTECA: 2 km arriba de San Marcos de Colon, 1100 m, 6 Aug 1955, Molina 5444 (GH).

G U A T E M A L A. SUCHITEPEQUEZ: Finca Moca, 3400 ft, 27 Oct 1934, Skutch 1549 (F,GH). RETALHULEU: Retalhuleu, 240 m, 17 Feb-1 Mar 1941, Standley 88584 (F). PETEN: Santa Elena, en orillando el camino para Santa Marta, a 4 km, 12 Dec 1970, Ortiz 1497 (MICH). IZABAL: between Milla 49.5 & Cristina, 65-70 m, 30 Mar 1940, Steyermark 38400 (F); l.c., 3 Apr 1940, Steyermark 38665 (F).

B E L I Z E (BR. HONDURAS). Monkey River, Toledo Dist., 30 Aug 1941, Gentle 3631 (A,F,MICH,MO,NY); Swasey Branch, Monkey River, 18 Jan 1942, Gentle 3876 (A,MICH,MO,NY); between Mullins River & Manatee, 16 Aug 1940, Gentle 3376 (MICH); All Pines, 5 ft, 8 Aug, Schipp 573 (A,BM,F,G,GH,MICH,MO,NY,S,UC).

M E X I C O. 1791, Haenke 1476 (NY). CHIAPAS: Mapastepec, 250 ft, 2 Nov 1945, Hernandez 242 (GH); Escuintla, Nov-Dec 1937, Matuda 2146

(F,MICH,NY); Mt. Ovando, Escuintla, 14 Nov 1945, Matuda 17083 (F,UC). YUCATAN: savanna de Lian, Jul, Linden s.n. (P). OAXACA: Guatulco, Oct 1842, Liebmann 5131 (F-frag.); Chitepec & vic., dist. Tuxtepec, 200 m, 30 Oct 1941, Martinez-Calderon 767 (MICH). VERA CRUZ: along Trans-isthmus Hwy, rt 185, 4 km Ne Minatitlan, isthmus Tehuantepec, 50 m, 3 Aug 1958, King 1050 (MICH). NAYARIT: near cult. areas 3 mi NE of Puga, 1000 m, 22 Aug 1959, Feddema 882 (MICH).

# W E S T I N D I E S

C U B A. LOCALITY UNKNOWN: Poeppig s.n. (W); 1824, Anonymous s.n. (W); 1843-44, Linden 2072 (BM,CGE,NY,W); 1863, Wright 234 (S); San Juan de Buenbouk, 17 Nov 1860-64, Wright 2330 (BM-2 sh.,G-2 sh., GH); savanna del Sumidero, Oct 1823, Poeppig s.n. (BM,NY,W); vic. Madruga, 25 Mar 1903, Britton, Britton, & Shafer 627 (NY); Couselaciou del Sur, 1 Nov 1914, Hermann s.n. (US). ISLA DE PINOS: Nueva Gerona, Jan 1904, Curtiss s.n. (NY); l.c., 8 May 1904, Curtiss 487 (BM,E,F,G, GH,M,MO,NY); between Mal Paris & La Ceiba, 26 Oct 1920, Ekman 11902 (G,S). PINAR DEL RIO: Tres Marias, Rangel, 500 m, Jul 1946, Alain 557 (GH); vic. Herradura, 26-30 Aug 1910, Britton et al. 6359 (NY); vic. San Diego de los Banos, 25 Aug 1914, Leon 4652 (NY). MATANZAS: E of Mantanzas, 4 Sep 1903, Britton 434 (NY); Lacret, 30 Sep 1954, Alain 4112 (GH). SANTA CLARA: Trinidad Mts., San Blas, Jun 1941, Howard 5267 (GH); San Blas, 600-1000 ft, 21 Jul 1930, Jack 8026 (A,S,US); Blanco Mts, Gavilaucito, 1 Aug 1918, Leon & Roca 8051 (NY); near Mordazo, 29 Dec 1915, Leon & Cazauas 5978 (NY); Cieuequita, 9 Oct 95, Combs 103 (F,GH,MO,NY,US); Laguna, Britton & Wilson 290 (NY). ORIENTE: Sierre de Nipe, prope Rio Piedra, 3-4 Mul 1914, Ekman 1826 (S); l.c., 4 Oct 1919, Ekman 9824 (S); sabanna Miranda, prope Bayate, 11 Jul 1914, Ekman 1936



(S); l.c., 14 Sep 1914, Ekman 2807 (S); Veguita, Baracoa, Oct 1939, Leon 17410 (GH); Tabajo, base of El Yungue, 1-2 Dec 1910, Shafer 7719 (GH,NY,U).

J A M A I C A. Wright s.n. (BM); road to Dolphin Peak, 1000 ft, 19 May 1906, Harris 9261 (BM,NY); Kellits, upper Clarendon, 2000 ft, 24 Sep 1912, Harris 11153 (BM,NY); Oxford, near Troy, 1400 ft, 18 Sep 1906, Harris 9429 (F,NY); Bauks, Oxford, 13-18 Sep 1906, Britton 688 (NY); near Port Antonio, 21 Jul 1897, Fredholm 3200 (NY,US); Guys Hill, St. Thomas in Vale, McNab s.n. (E) and 1844 (E,S).

H A I T I. Massif de la Pelle, morne de l'hôpital between Décalette and Dufréné, 500 m, 28 Sep 1924, Ekman H2048 (S); Marmelade, 3200 ft, 24 Aug 1903, Nash 717 (NY).

D O M I N I C A N R E P U B L I C. S. Dom., Richard s.n. (P); St. Dominique, 1822, Poiteau s.n. (type? of synonyms Galactia tetragona and Clitoria tetragona Poir.: P); l.c., 1823, Poiteau s.n. (BM). SANTO DOMINGO: Cordillera Central, near La Cumbre, 400 m, 4 Feb 1929, Ekman H11434 (S); Llano Castero, Cuensa, at La Ceiba, 13 Aug 1929, Ekman H13343 (G,GH,NY,S). SEIBO: Guarabo, SE Jovero, 0-100 m, 8 Nov 1923, Abbott 2774 (G,GH-2 sh.,US); l.c., 22 Nov 1923, Abbott 2819 (US).

P U E R T O R I C O. Anonymous s.n. (type? of synonym Clitoria tetragona Vahl: G-2 sh.); Colonia, San Miquel, 2-5 Mar 1913, Britton & Shafer 1621 (NY,US); Dorado, 20-22 Mar 1922, Britton, Britton, & Brown 6662 (F,NY); vic. Martin Pena, 28 Jun 1923, Britton & Britton 7115 (NY); Los Lameyes, Jun 1883, Eggers 1351 (US); Caguas, 16 Nov, Goll 373 (NY, US); Monacillo, 14 Nov. Goll 299 (US); Rio Piedres, 19 Nov 1911, Johnston 31 (NY); l.c., 16 Nov 1913, Stevenson 463 (US); southern slopes of Luquillo mts., 300-400 m, 29 Sep 1963, Liogier 10284 (F,NY,S,US,VEN);

Hato Tejas, 22 Feb 1964, Liogier 10689 (GH,NY,US); Mayagüez, 20 Oct 1884, Sinten 74 (G-3 sh.,GH,M,S,US); Aguada, 18 Dec 1886, Sinten 5737 (US); Naguabo Playa, 14 Jan 1967, Wagner 1077 (A,BM,MO,U,WIS); above Ceiba, 8 Dec 1968, Wagner 1777 (A,U).

G U A D E L O U P E. Forsström s.n. (S); 27 Oct, Questel 5086 (P).

M A R T I N I Q U E. Richard s.n. (P)-2 sh.); St. Pierre, environs Macomba, 1882, Duss 1075 (NY).

T R I N I D A D A N D T O B A G O. TRINIDAD: 1877-80, Fendler 299 (BM,E); Aripo road, 17 Dec 1926, Broadway 6447 (BM,F,MO,S); Piarco Savanna, 20 Sep 64, Bhorai 862 (US); l.c., 15 Mar 1921, Britton & Broadway 2321 (NY). TOBAGO: Botanical Station at Scarborough, 19 Feb 1932, Fairchild 2926 (US); l.c., 8 Nov 1932, Broadway 9049 (BM-2 sh., MO); Bacolet, 20 Oct 1889, Eggers 5463 (NY,P).

#### A F R I C A

L I B E R I A. CENTRAL: Monrovia, 19 Nov 1926, Linder 1518 (GH); l.c., 8 Sep 1920, Dinklage 2764 (A).

G O L D C O A S T. GOLD COAST CONOLY: Atramkwa ur Elmina, 0 m, 1-12-57, Hall 948 (K).

N I G E R I A. S. Nigeria, 1909, Kitson s.n. (BM). CALABAR: Oban, 1911, Talbot 1305 (BM,K); Eket Dist., 1912-13, Talbot & Talbot 3550 (BM-2 sh.). OWERRI: Umuduwe, dist. Okigwi, 15 Aug 42, Jones 2014 (BM).

57ab. Clitoria falcata Lam. var. falcata f. heteromorpha

(Griseb.) Fantz, comb. nov.

Clitoria glycinoides DC. f. heteromorpha Griseb., Cat. Pl.

Cuba 74. 1866.

Clitoria glycinoides DC. var. ecostata Urb., in Duss Fl.

Ph. Ant. Fr. 208. 1897; nom. nud.

Clitoria rubiginosa Juss. ex Pers. var. ecostata (Urb.)

Stehlé, Bull. Agr. Mart. 4(3-4): 259. 1937; nom. nud.

Clitoria rubiginosa Juss. ex Pers. var. ecostata (Urb.)

Stehlé, in Stehlé & Quentin F. Guad. & Dep. 107. 1948;

nom. nud.

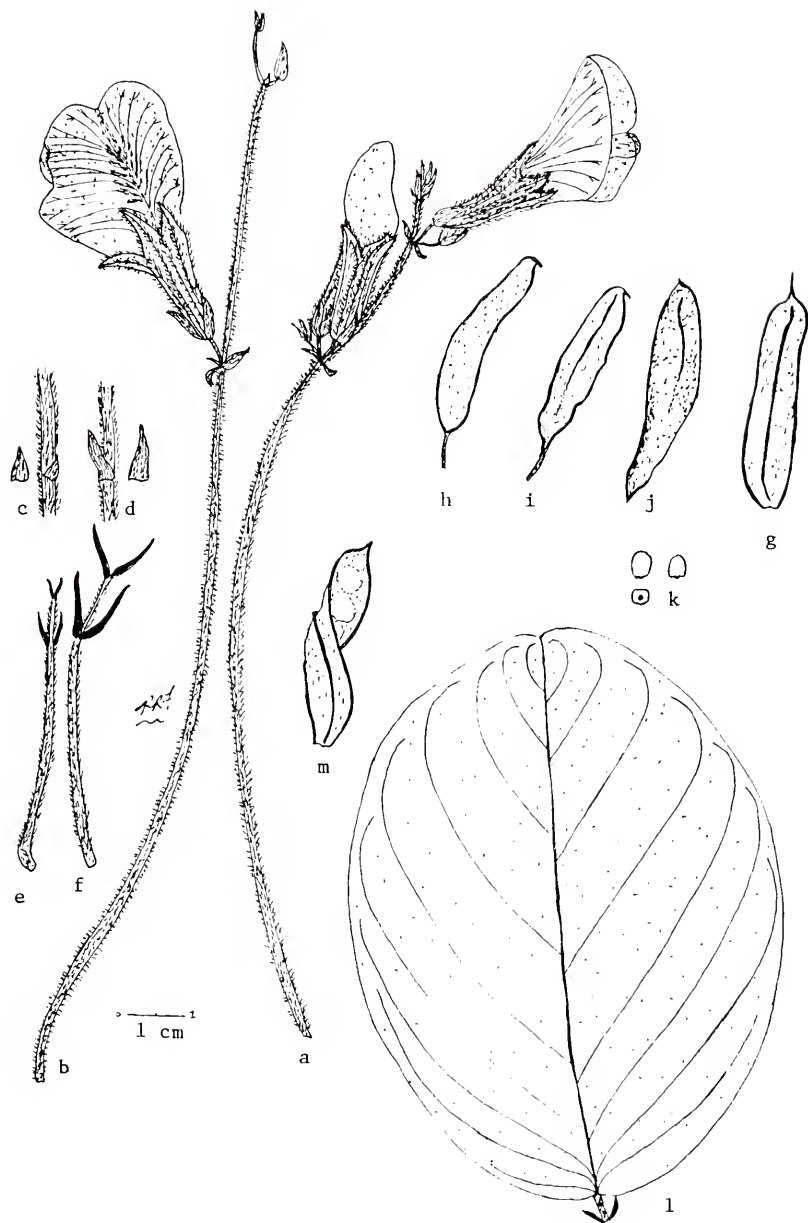
Stipules and stipels 3-6 (7) mm long. Inflorescence with flowers close together at peduncle apex, first internode of rachis 0.5-2 cm long. Legume with imperfectly formed costa extending ca one-third to two-thirds the valve length, or occasionally nearly the length of the valve but weakly raised, rarely ecostate. Figure 124.

TYPE COLLECTION: CUBA. 1860-64, Wright 2331 (LECTOTYPE: G-139, De Candolle. Isolectotypes: BM,GH,NY,S,W 169612).

Grisebach cited only the Wright 2331 collection when he published his description of the form, but did not designate where the type was deposited. The Geneva specimen is the only one to bear the form name heteromorpha, and as the specimen which is more probably the one examined by Grisebach, it is designated as the lectotype. This specimen has mature fruits from cleistogamous flowers bearing imperfectly formed costas or lacking a costa. Wright did not specify any locality, but his prior collection, 2330, was collected from San Juan de Buenavista (=f. falcata). A good representative collection of the types of costas present in this form can be observed in Faris 597 (US 1145183).

Specimens with ecostate fruits may be confused with those of var. glabrescens which can be distinguished by the glabrescent pubescence

Figure 124. Clitoria falcata - II. Var. falcata f. falcata:  
 (a) elongated inflorescence, x 1; (c) portion of stem with  
 stipule, x 1; (e) petiole and rachis with stipels, x 1;  
 (g) costate legume, x 1; (k) three views of seed, x 1.  
 Var. falcata f. longirachis: (b) inflorescence, x 1.  
 Var. falcata f. stipulacea: (d) portion of stem with  
 stipule, x 1; (f) petiole and rachis with stipels, x 1.  
 Var. falcata f. heteromorpha: (h-j) ecostate and  
 imperfectly costate legumes, x 1. Var. latifolia:  
 (l) leaflet, x 1; (m) costate legume, x 1. (Tyson 1302,  
 MO 1813032: a,c,e. Wagner 1077, A: g,k. Feddema 1010,  
 MICH: b. McNab 1840, E-6: d,f. Faris 597, US 1145183:  
 h-j. Ducke 16739, BM: 1-m.)



on the stems, petioles, and lower leaf surfaces, as well as relatively few macrotrichomes on the calyx. Juvenile stems and petioles of f. heteromorpha have conspicuously dense, rufus trichomes, whereas those of var. glabrescens are sparse and whitish.

DISTRIBUTION (Figure 123): Scattered within the range of the typical form in Central America and the West Indies, rarely in South America.

C U B A. ISLA DE PINOS: San Pedro, 12 Feb-22 Mar 1916, Britton & Wilson 14557 (NY-2 sh.). PINAR DEL RIO: near Cjabana, La Palma, 10 Oct 1949, Alain 1180 (GH). HABANA: La Jata, Guanabacoa, 10 Sep 1914, Leon 4562 (GH).

D O M I N I C A N R E P U B L I C. Nigua, waterhole, Sep 1921, Farris 597 (GH,US).

P U E R T O R I C O. Santurce, vic. San Juan, 11-12 Feb 1914, Britton & Cowell 1468 (F,NY,US); Hato Tejas, 22 Feb 1964, Lioquier 10689 (GH,NY,US).

G U A T E M A L A. ALTA VERAPAZ: along Rio Icolay, N & NW Finca Cubilguitz to Quebrada Diablo, 300-350 m, 6 Mar 1942, Steyermark 44801 (F).

H O N D U R A S. ATLANTICA: vic. Tela, 0 m, 14 Dec 1927 - 15 Mar 1928, Standley 55143 (F,US).

V E N E Z U E L A. APURE: sabannas del hato El Frio, entre El Saman y Mantecal, 28 Oct 1970, Ramía 3934 (VEN).

57ac. Clitoria falcata Lam. var. falcata f. stipulacea Fantz,  
f. nov.

Stipules and stipels 7-10 mm long; stipules 5 mm wide.

Inflorescence with flowers crowded at apex of peduncle. Legume not seen. Figure 124.

TYPE COLLECTION: JAMAICA. Guys Hill, St. Thomas in Vale, McNab 1840 (E-6).

The stipules and stipels are very distinct in this form because of their large size.

DISTRIBUTION (Figure 123): This form is known only from the type locality in Jamaica.

57ad. Clitoria falcata Lam. var. falcata f. longirachis Fantz,  
f. nov.

Stipules and stipels 3-6 mm long. Inflorescence highly elongated, 18-24 cm, flowers well separated, first internode of rachis 4-5 cm. Legume not seen. Figure 124.

TYPE COLLECTION: MEXICO. Nayarit: along road to Miramor & Santa Cruz, ca 15 km SE of San Blas & 1.5-2.5 mi W of Tetitata, 26 Aug 1959, Feddema 1010 (HOLOTYPE: MICH).

The inflorescence is very distinct in this form, slender and highly elongated, unlike the typical stout, often much shorter inflorescences common within the species. The rachis is also elongated, spreading the flowers well apart from each other.

DISTRIBUTION (Figure 123): This form is known only from the type locality in Nayarit, Mexico.

57b. Clitoria falcata Lam. var. latifolia (Rizz.) Fantz, comb.  
nov.

Clitoria rubiginosa Juss. ex Pers. f. latifolia Rizz.,

Arq. Jard. Bot. Rio de Jan. 17: 180. 1963.

Clitoria glycinoides DC. f. latifolia Rizz., nom. in sched.

Stem with upper portion conspicuously pubescent, trichomes dense, erect, rufus. Leaflets conspicuously pubescent on the lower surface, leaflets broad, 5-8 cm wide on larger leaflets. Flowers ca 4 cm long. Calyx tube 12-15 mm long, pilose, lobes ovate-lanceolate, 2-4 mm wide. Bracteoles oblong-lanceolate, abruptly acuminate, elongated, 10-15 mm long, 4-6 mm wide. Figure 124.

TYPE COLLECTION: BRAZIL. Pará: Mayen Tapajoz, Cachoeira do Mangabal, 8-2-1917, Ducke 16739 (HOLOTYPE: RB 11861, mounted on 2 sheets. Isotype: BM).

This variety is distinguished easily by the broad leaflets, medium-sized flowers, and broad, elongated bracteoles. With distinguishable characteristics in addition to the broader leaflets, Rizzini's form is elevated to the level of variety.

DISTRIBUTION (Figure 122): This variety is known only from the type locality in Pará, Brazil.

57c. Clitoria falcata Lam. var. aurantiaca (Benth.) Fantz, comb.  
nov.

Neurocarpum rufescens Benth., Ann. Wein. Mus. Natur. 2:

116. 1837.



Clitoria rufescens (Benth.) Benth., Journ. Linn. Soc. 2:

39. 1858.

Clitoria glycinoides DC. var. ?aurantiaca Benth., in Mart.

Fl. Bras. 15(1): 119. 1862.

Clitoria glycinoides DC. var. megapotamica Malme, Ark. Bot.

Stockh. 23A(13): 32. 1931.

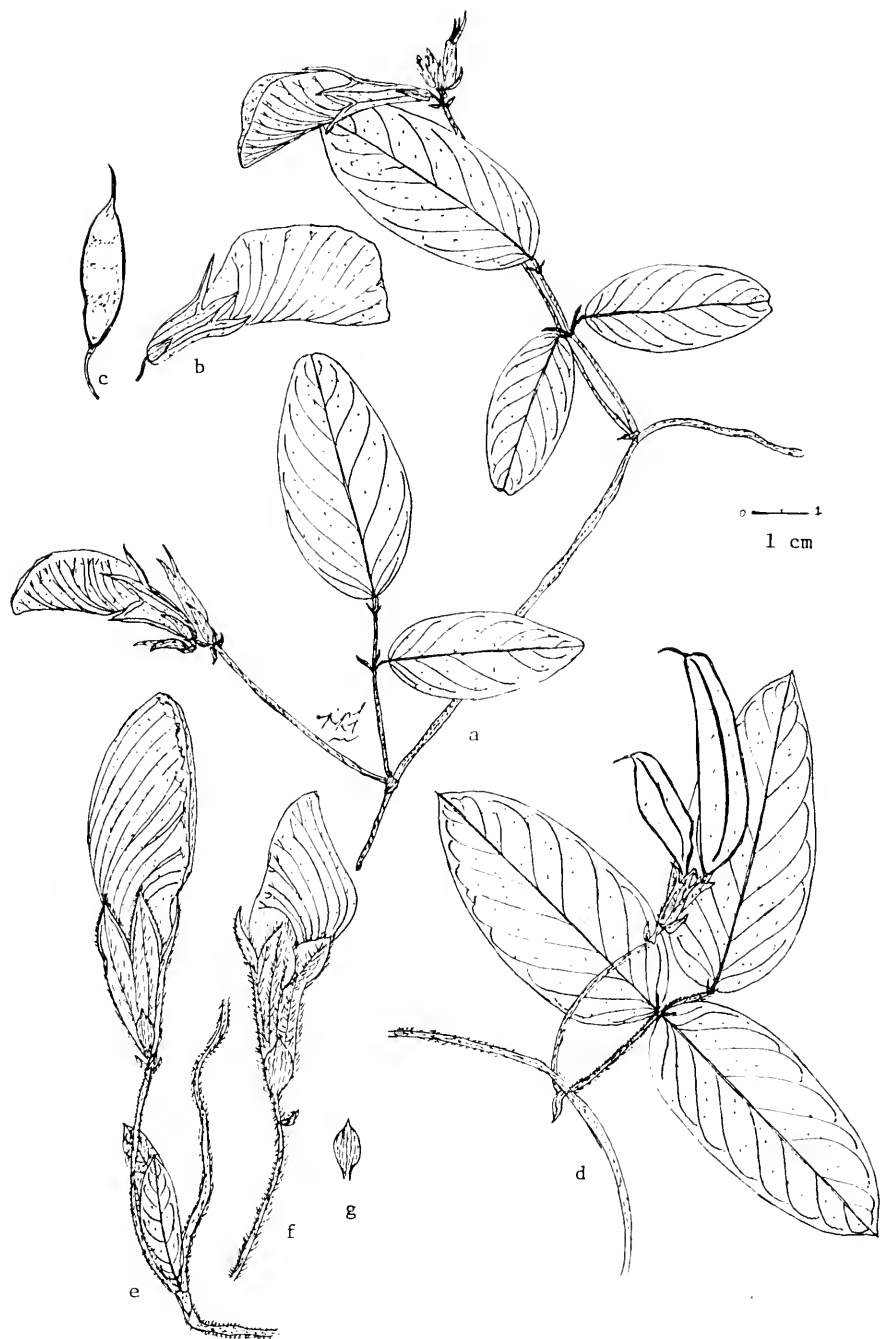
Stem with upper portion conspicuously pubescent, trichomes dense, erect, rufus. Leaves conspicuously pubescent on the lower surface, commonly oblong, 3-5.5 cm wide. Flowers large, (5.5) 6-7.5 cm long, vexillum becoming dark yellowish-orange to orange in the dried state. Calyx tube 16-20 mm long, lax pilose with trichomes primarily along ventral and dorsal surfaces; calyx lobes oblong, abruptly acuminate, broad, 4-7 mm wide. Bracteoles oblong, obtuse, widening above the middle, base attenuate. Figure 125.

This variety is characterized as having oblong leaflets, large flowers becoming orangish in the dried state, elongate calyx tubes, broad calyx lobes, and bracteoles with an attenuate base.

TYPE COLLECTION: BRAZIL. Rio Grande; fl. orange flushed red, Fox 325 (HOLOTYPE: K-19, hb. Hooker; S=photo of K).

Bentham published his variety preceded by a question mark and with a short diagnosis of the orangish flowers and broad calyx lobes, two of the diagnostic characteristics. Article 34, Note 1 of the International Code of Botanical Nomenclature (1972) indicates that the question mark does not indicate taxonomic doubt when published and accepted by the author, the name thus validly published. Malme (1931) interpreted Bentham's name as published with an incomplete description

Figure 125. Clitoria falcata - III. Var. glabrescens: (a) portion of stem, x 1; (b) flower, x 1; (c) ecostate legume, x 1. Var. aurantiaca: (d) older portion of stem, x 1; (e) juvenile portion of stem, x 1; (f) inflorescence, x 1; (g) bracteole, x 1. (Sandwith 1754, K-12: a. Toms 1927, K-306: b-c. Malme 1102, S: d. Dusen 16257, A: e. Irwin et al. 13565, NY: f-g.)



and proceeds to give a fuller description citing his collection (II:1102) as the type with a second collection (Regnell III:437) cited below. Malme made no mention of the Fox (Hb. Hooker) specimen cited by Bentham. By priority, Bentham's name is the correct varietal name.

Bentham neglected to cite the collection number of the Fox specimen, but he did note that the specimen was in the Hooker Herbarium. With only one specimen indicated and its place of deposit specified, there is no doubt that it is the holotypic specimen, thus it is not necessary to designate this specimen as the lectotype.

Clitoria rufescens is rarely mentioned in the literature, or when included, the author usually has not examined the type (e.g. Rizzini, 1963) and reports this species as rare. The type is "In campis editis ad Tejuco et Villa do Principe, prov. Minas Gerais, Martius s.n. (M 12446!) which agrees with this variety and the type collection, Fox 325 (K-hb. Hooker!).

DISTRIBUTION (Figure 122): This variety is common in southern Brazil.

B R A Z I L. GOIAS: ca 25 km S Cristalina, 17°S-48°W, 1150 m, 9 Mar 1966, Irwin et al. 13829 (NY); l.c., 1200 m, 5 Mar 1966, Irwin et al. 13565 (NY). MINAS GERAIS: Caldas, 18 Jan 1860, Regnell III:437 (S-2 sh.) and 18--., III:437 (S) and 26 Dec 1862, III:437 (S); Tejuco et Villa Principe, May, Martius s.n. (M). PARANÁ: Dec 1903, Dusén s.n. (S); 23 Turina, 22 Jan 1910, Dusén 9096 (S); Desvio Ribas, 22 Feb 1910, Dusén 9461 (S); l.c., 17 Feb 1911, Dusén s.n. (S); Tres Barras, in aggre viae ferreae, 860 m, 26 Jan 1916, Dusén 17685 (F,G,GH,MO) and l.c. in pseudo campo, 760 m, 31 Jan 1916, 17685 (G,S); Terrinha, 840 m, 2 Jan 1915, Dusén 16257 (A-2 sh.,F,G,MO,PH,S); Park Santa Maria near

Tamandare, 10 km N of Curitiba, Lindemann & Haas 4000 (U); Rio Taquari, Mun 4-Barras, 850 m, 9 Jan 1969, Hatschbach 20686 (MICH,MO,NY,US); Col. S. Reque, mun. Piraquara, 6 Feb 1971, Hatschbach 26289 (MICH,S,UC). SANTA CATARINA: Mun. Porto Uniao, Fazenda Frei Rogerio, 12 km E of Porto Uniao, 750 m, 18 Dec 1956, Smith & Reitz 3711 (US); l.c., 4 Feb 1957, Smith & Klein 10744 (US); Mun. Porto Uniao, E of Valoes, Irineopolis, on road to Canoinhas, 750 m, 17 Dec 1956, Smith & Reitz 8615 (US); l.c., 3 Feb 1957, Smith & Klein 10705 (US). RIO GRANDE DO SUL: Cruz Alto, 16 Jan 1902, Malme II:1102 (S-2 sh.).

57d. Clitoria falcata Lam. var. glabrescens (Verdc.) Fantz,  
comb. nov.

Clitoria rubiginosa Juss. ex Pers. var. glabrescens Verdc.,  
Kew Bull. 24(2): 253. 1970.

Clitoria rubiginosa Pers. var. glabra Verdc., nom. in sched.

Stem with upper portion glabrescent to glabrous, trichomes scattered, erect, whitish. Leaves glabrescent or thinly pubescent on lower surface, leaflets commonly 3-5.5 (6) cm wide on larger leaflets. Flowers medium-sized, 3.5-5.5 cm. Calyx tube 10-16 mm long, pubescence uncinuate with sparse, spreading trichomes (seemingly glabrate to glabrescent), lobes ovate-lanceolate, 2.5-4 mm wide. Bracteoles ovate-lanceolate to lanceolate, base broadly cuneate. Legume ecostate. Figure 125.

Verdcourt's variety is distinguished easily by the glabrescent appearance of the stem, petioles, and calyx, the sparsely pubescent lower surface of the leaves, and the ecostate fruits.

TYPE COLLECTION: TOBAGO. In Coconut plantations, Bacolet, 13 Oct 1937, Sandwith 1753 (HOLOTYPE: K-17).

DISTRIBUTION (Figures 111 and 123): This variety is somewhat common in western Africa, and less frequently collected in Zanzibar and the West Indies.

P O R T U G U E S E G U I N E A. Fulacunda, 12 May 1945, Santo 2024 (K-2 sh.).

S I E R R A L E O N E. along Waanjee River near Baba (Nongoba Bullom), 10-5-60, Bakshi 176 (K).

L I B E R I A. CENTRAL: Sanokwele Dist., Gbau, 22 Sep 1947, Baldwin Jr. 9412 (K).

N I G E R I A. Olokemeji, 20 Aug 1907, Foster 319 (K); Lagos, Nov. 1894, Meller 129 (K).

T A N Z A N I A. ZANZIBAR: Vaughan 86 (BM); 1927, Toms 115 (K); Kirk s.n. (K); Masingini Ridge, 1 Feb 1929, Greenway 1290 (K); Pemba, Dowson 125 (K).

G U A D E L O U P E. Lamentin, 1893, Duss 3233 (NY).

58. Clitoria nana Benth., Journ. Linn. Soc. 2: 40. 1858.

Small suffrutescent herb, ascending to erect, 10-35 cm tall. Stems weakly quadrate, longitudinally striated-caniculate, becoming terete, 1-2 mm thick, ascending to erect, juvenile stem pilose with uncinat trichomes beneath, becoming sparsely uncinat-pubescent, then glabrous, pith solid to minutely hollow, internodes 0.5-4 (7) cm. Leaves subcoriaceous, 3- and 1-foliate, subsessile, leaflets oblong-elliptic, occasionally obovate, concolorous, apex acute to obtuse, mucronate,

sometimes bearing a short acumen, base broadly cuneate, midrib weakly raised above, primary nerves of 4-6 pairs, upper surface glabrous, lower surface uncinat-pubescent and pilose, lamina 1.5-6 cm long, 0.7-3 cm wide; terminal leaflets commonly larger than lateral leaflets; unifoliate leaves occasionally borne at lower nodes. Petioles 0.4-1.5 cm long, longer than rachis, weakly quadrangular, caniculate, sparsely pilose and uncinat-pubescent; rachis 0.3-0.9 cm long, similar to petiole; rachis plus petiole typically less than 2 cm. Petiolules subquadrangular, rugose, dark-colored, 1-2 mm long, sparsely pilose and uncinat-pubescent. Stipules ovate-lanceolate, acute, 7-9 mm long, 2-5 mm wide, short-pilose and uncinat pubescent, ciliate; stipels subulate, 1-nerved, 2-7 mm long, 0.1-0.4 mm wide, uncinat-pubescent.

Inflorescence axillary, racemose, commonly 1- (2-) flowered borne at the apex of the peduncle, bearing chasmogamous or cleistogamous flowers.

CHASMOGAMOUS FLOWERS: Peduncles 0.3-6 cm long, weakly quadrangular, sparsely pilose and uncinat-pubescent. Pedicels 4-8 mm, dark-colored, sparsely pilose and uncinat-pubescent. Bracts lanceolate, acute, ciliate, pilose, and uncinat-pubescent, middle bracts 5-6 mm long, 1 mm wide, outer bracts 1-2 mm long, 0.5-1 mm wide. Bracteoles oblong-lanceolate, acute, appressed to calyx and extending slightly past calyx throat, (6) 8-11 mm long, 1.5-2 mm wide, borne 0.5-1 mm below calyx base, uncinat-pubescent, and pilose-ciliate toward apex. Calyx weakly 10-nerved, uncinat and pilose-pubescent, tube 0-12 mm long, 2-3 mm wide at base expanding to 5-10 mm at the throat, lobes ovate-lanceolate, long-acuminate, 8-12 mm long, 2.5-3 mm wide. Vexillum showy, highly conspicuous amongst the small leaves, light blue to lilac, 3.5-5 cm long, blade 3.5-4 cm wide, pubescence sparsely appressed, claw 6-7 mm.

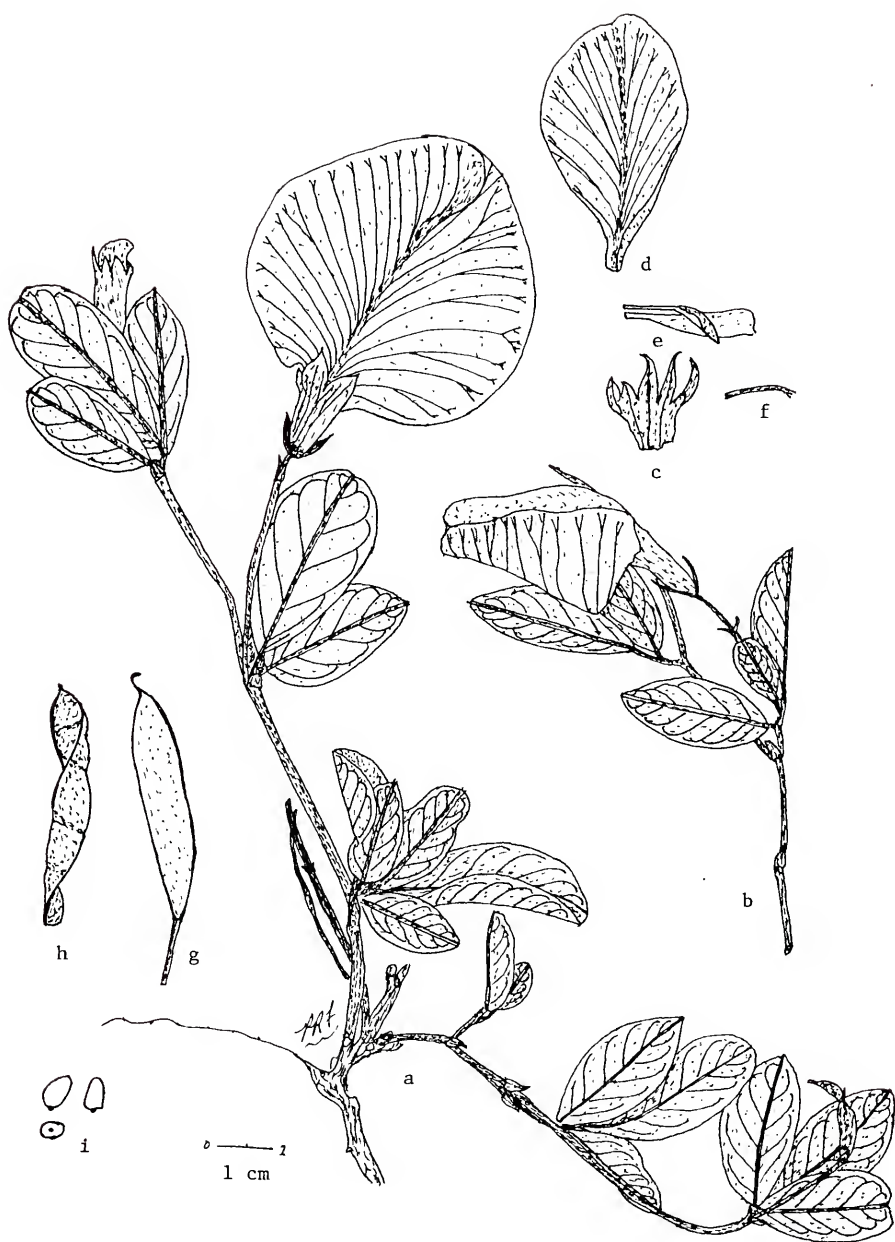
Alae extended past the carina 7-11 mm, blade 16-18 mm long, 5-8 mm wide, claw 8-12 mm. Carina blade 8-12 mm long, 4-5 mm wide, claw 11-15 mm. Staminal tube 18-22 mm long, vexillary stamen coherent near base, free filaments 2-4 mm; anthers ovate, 1.5-1.6 mm long, 0.7-0.8 mm wide. Gynophore 3-5 mm, dark-colored, uncinat-pubescent with sparse macrotrichomes; ovary 9-10 mm long, 1.3-1.5 mm wide, ecostate, pubescence of dense, appressed, white trichomes; style slightly longer than ovary, 11-15 mm long, geniculate 6-7 mm from the distal end; stigma capitate. Legume stipitate, ecostate, both sutures thickened, valves convex, turgid, short-pilose, 3.5-4.5 cm long, 7-9 mm wide; stipe enclosed within calyx, 6-9 mm long; beak lacking to 6 mm; dehiscence causing valves to twist one-quarter to one-half of a turn. Seeds dark reddish-brown, subglobular, slightly wider than long, 3-4.5 mm long, 4-5 mm wide, 2-3 mm thick. CLEISTOGAMOUS FLOWERS minute, typically borne at lower nodes. Peduncles 0.4-0.7 cm long. Pedicels 2-4 mm. Bracts 1.5-3 mm long, 1 mm wide. Bracteoles oblong-lanceolate, acute, 4-5 mm long. Calyx tube 6-7 mm long, lobes 5-6 mm. Staminal tube nearly lacking, ca 0.5 mm long, free filaments 2-4 mm. Gynophore 3 mm; ovary 4-5 mm long; style 4-5 mm long, abruptly bent backwards upon ovary. Legume similar to those of chasmogamous flowers. Figure 126.

Dwarf Clitoria is characterized as a small trailing herb with flowers conspicuously larger than the small leaves, short calyx tubes with lobes nearly equalling the tube, and turgid, ecostate, short-pilose fruits.

PHENOLOGY: Flowers and fruits are borne from mid-November through March.



Figure 126. Clitoria nana. Var. nana: (b) habit, x 1; (c) calyx, x 1; (d) vexillum, x 1; (e) ala and carina, x 1; (f) androecium, x 1; (g-h) legumes, x 1; (i) three views of seed, x 1. Var. caaguazuensis: (a) habit, x 1. (Sellow 3363, PR: b-f. Krapovickas et al. 16734, MO 2038573: g-i. Hassler 9110, NY: a.)



TYPE COLLECTION: BRAZIL. Rio Grande do Sul: dry fields near Porto Alegre, 1829, Tweedie 365 (LECTOTYPE: K-21, Hb. Bentham; S= photo of K. Isolectotype: K-21, Hb. Hooker.).

Bentham cited only one collection, but did not designate the depository of the type. Two collections have been examined, both mounted on the same herbarium sheet at Kew. The specimen originally mounted on a sheet in Bentham's herbarium has since had the herbarium sheet cut around the plant, and then this piece mounted adjacent to a specimen from Hooker's herbarium which was mounted on a Kew sheet. The specimen deposited in Bentham's herbarium is designated as the lectotype because Bentham is known to have examined this specimen, and it bears the name Clitoria nana. The specimen deposited in Hooker's herbarium is an apparent duplicate, lacks any identification, and accessioned to Hooker's herbarium in 1867, nine years after Bentham published his description of the species.

NOTES: Clitoria nana has close affinities with C. guianensis which can be easily distinguished as a subshrub with elongate, narrow leaflets, a longer calyx tube, staminal tube, and style, much larger flowers, and usually costate legumes borne on longer stipes and lacking the pilose pubescence.

DISTRIBUTION (Figure 114): This species occurs in dry grasslands of southern Brazil, northern Argentina, and Paraguay. Elevations commonly are not reported by collectors.

#### KEY TO VARIETIES

1. Calyx tube narrow, 5-7 mm wide at the throat; peduncles short, commonly 5-25 mm long; terminal leaflet oblong-elliptic to elliptic, to sometimes obovate-elliptic, apex broadly acute to obtuse;

bracteoles commonly 8-11 mm (Brazil, Argentina). . . . .

. . . . . 58a. var. nana.

1. Calyx tube broad, 7-10 mm wide at the throat; peduncles elongate, commonly 20-60 mm long, terminal leaflet obovate, apex broadly obtuse to truncate; bracteoles commonly 6-8 mm (Paraguay) . . .

. . . . . 58b. var. caaguazuensis

58a. Clitoria nana Benth. var. nana.

Plants small, leaves with terminal leaflet oblong-elliptic to elliptic, occasionally obovate-elliptic, apex acute to obtuse. Stipules 2-4 mm wide. Peduncles 0.5-2.5 cm. Bracteoles commonly 8-11 mm, nearly equalling the tube length. Calyx tube narrow, 5-7 mm wide at the throat. Figure 126.

DISTRIBUTION (Figure 114): This variety is found from southern Brazil to northern Argentina.

B R A Z I L. RIO GRANDE DO SUL: Sello 3363 (F,P,PR); Pelotas, 28 Dec 1954, Sacco 262 (MO,RB,UC); Eachaeira, 6 Jan 1902, Malme 1045a (S) and 10 Jan, 1045 (S); Porto Alegre, 26 Nov 1901, Malme 1045b (S); l.c., Morro Santana, 18 Mar 70, Vianna, Alves, & Baptista 7606 (U); Soledade, 550 m, 28 Feb 06, Bornmuller 640 (GH); Sapucaya, 29 Nov 1948, Rambo 38413 (F).

A R G E N T I N A. CORRIENTES: Virasoro, 16 Nov 1944, Tharrola 1284 (NY); l.c., Oct-Nov 1966, Anonymous s.n. (SI); Establecimiento Las Marias, Ruta Nac. No. 14, 7 km S de Gdor Virasoro, 30 Nov 1970, Krapovickas et al. 16734 (MO,UC,WIS). MISSIONES: Apóstoles, 27 Jan 1926, Clos 1948 (GH); l.c., 25 Dec 1971, Lirussi 1056 (SI); Itacaruaré,

17 Feb 1945, Burkart 15421 (SI); 30 km de L.N. Alem comino a San Javier sobre ruta 4, 13 Mar 1969, Krapovickas et al. 15215 (UC); Zuiman, Subesfacción Experimental, Jan 1967, Jeckeln 36 (SI).

58b. Clitoria nana Benth. var. caaguazuensis Hassler, in Fedde's Repert. Spec. Nov. Regni Veg. 8: 128. 1910.

Plants robust. Leaves with terminal leaflet obovate, apex obtuse to truncate. Stipules 3-5 mm wide. Peduncles 2-6 cm. Bracteoles commonly 6-8 mm long, shorter than the calyx tube. Calyx tube broad, 7-10 mm wide at the throat. Figure 126.

TYPE COLLECTION: PARAGUAY. In campis siccis prope Caaguazú, Mar 1905, Hassler 9110 (LECTOTYPE: G-274. Isolectotypes; BM,F 1546830, GH,K-22,MPU-40,NY,S,UC 929017,W 1451).

Hassler cited only the one collection, but did not designate where the type was deposited. Any of the specimens from this collection are sufficient to be designated as the lectotype as all are representative, but the Geneva specimen was chosen as the lectotype because it has a dissected flower placed in a packet on the herbarium sheet as well as the only one bearing field data on the label, which is "Suffrutescens prostratus 0.1-0.2 m, flos. lilacinus, prope Caaguazu in campis."

DISTRIBUTION (Figure 114): This variety is known only from two localities in Paraguay.

P A R A G U A Y. Campo Tapytá, Mar 1931, Jorgensen 4621 (A,F-2 sh., MO,NY,PH,S,US).

NUMERICAL LIST OF TAXA

I. Subg. Bractearia

A. Sect. Bractearia

1. C. arborea
  - a. var. arborea
  - b. var. longiramosa
  - c. var. pseudoamazonica
2. C. fairchildiana
3. C. andrei
4. C. juinensis
5. C. moyobambensis
6. C. amazonum
  - a. f. amazonum
  - b. f. vulgaris
7. C. nervosa

B. Sect. Flexuosa

8. C. woytkowskii
9. C. flexuosa
  - a. var. flexuosa
  - b. var. brevibracteola
10. C. pozuzoensis
  - a. var. pozuzoensis
    - aa. f. pozuzoensis
    - ab. f. subpalmata

b. var. schunkeiC. Sect. Brachycalyx11. C. brachystegia12. C. hermannii13. C. glaberrima14. C. canescens15. C. brachycalyx16. C. dendrina17. C. froesiiD. Sect. Cauliflorae18. C. arborescens19. C. javitensisa. var. javitensisaa. f. javitensisab. f. bracteosubtendab. var. portobellensisba. f. portobellensisbb. f. pilosabc. f. truncatac. var. longilobad. var. grandifoliae. var. klugii20. C. cavalcantei21. C. coriacea22. C. tunuhiensis23. C. sagotiia. var. sagotiib. var. caniculata

- c. var. sprucei
- 24. C. kaieteurensis
- 25. C. pendens
- 26. C. leptostachya
  - a. var. leptostachya
  - b. var. fruticosa
- 27. C. selloi
- 28. C. obidensis
- 29. C. plumosa

## II. Subg. Clitoria

- 30. C. lasciva
- 31. C. ternatea
  - a. var. ternatea
    - aa. f. ternatea
    - ab. f. pauciflora
    - ac. f. fasciculata
    - ad. f. albiflora
  - b. var. angustifolia
  - c. var. pleniflora
    - aa. f. pleniflora
    - ab. f. leucopetala
    - ac. f. subpolyadelpha
- 32. C. heterophylla
  - a. var. heterophylla
  - b. var. pedunculata
- 33. C. biflora
- 34. C. kaessneri



III. Subg. NeurocarpumA. Sect. Mexicana

- 35. C. polystachya
  - a. var. polystachya
  - b. var. congesta
- 36. C. monticola
- 37. C. triflora
- 38. C. humilus
- 39. C. mexicana
- 40. C. cordobensis
- 41. C. mariana
  - a. var. mariana
    - aa. f. mariana
    - ab. f. pedunculata
    - ac. f. pubescentia
  - b. var. orientalis

42. C. fragransB. Sect. Tanystyloba

- 43. C. macrophylla
  - a. var. macrophylla
  - b. var. sericea
  - c. var. stipulacea
- 44. C. javanica
- 45. C. cordiformis
- 46. C. linearis
- 47. C. hanceana
  - a. var. hanceana
  - b. var. thailanensis

- c. var. laureola
- d. var. latifolia
- e. var. petiolata
- 48. C. australis
- C. Sect. Neurocarpum
- 49. C. stipularis
  - a. var. stipularis
  - b. var. latifolia
- 50. C. densiflora
- 51. C. irwinii
- 52. C. laurifolia
  - a. f. laurifolia
  - b. f. glabrior
  - c. f. fasciculata
  - d. f. parvifolia
  - e. f. petiolata
- 53. C. guianensis
  - a. var. guianensis
    - aa. f. guianensis
    - ab. f. macrofructa
    - ac. f. imperfecta
    - ad. f. unifoliata
  - b. var. macrocleistogama
  - c. var. chapadensis
- 54. C. epetiolata
  - a. var. epetiolata
  - b. var. angustissima
  - c. var. latiuscula

- 55. C. simplicifolia
- 56. C. flagellaris
- 57. C. falcata
  - a. var. falcata
    - aa. f. falcata
    - ab. f. heteromorpha
    - ac. f. stipulacea
    - ad. f. longirachis
  - b. var. latifolia
  - c. var. aurantiaca
  - d. var. glabrescens
- 58. C. nana
  - a. var. nana
  - b. var. caaguazuensis

## NOMINA ET SYNONYMA CLITORIA COMPLECTENS

This chapter includes a compilation of those names associated with the genus Clitoria that were published after Linnaeus' "Species Plantarum," from 1753 to the present, as well as those unpublished names found on herbarium labels (nomina in schedula) and any new names presented in this monograph. The genus Clitoria will be listed first followed by other genera in alphabetical order. Names are arranged under each genus by taxonomic level in a descending rank and alphabetized at each level. Names adopted in this monograph are listed in lower case letter and underlined. Synonyms are listed with capital letters. Excluded names and those of dubious status are listed in capital letters and preceded by an asterisk (\*).

Clitoria L., Sp. Pl. ed. 1. 2: 753. 1753.

Subgenus Bractearia (Mart. ex Benth.) Fantz, stat. nov.

Subgenus Clitoria.

Subgenus Neurocarpum (Desv.) Baker, Fl. Br. India 209. 1879.

Subgenus TERNATEA (DC) Baker, l.c. 208. = Subgenus Clitoria.

Section Brachycalyx Fantz, sect. nov.

Section Bractearia Mart. ex Benth., Ann. Wein. Mus. Natur. 2: 115. 1837.

Section Cauliflorae Fantz, sect. nov.

\*Section CENTROSEMA DC., Prod. 2: 234. 1825 = Centrosema.

Section CLITORIANTHES Benth., Journ. Linn. Soc. 2: 41. 1858  
= Section Bractearia.

Section DENDROCYAMUS Benth., Ann. Nat. Hist. 3: 44. 1839  
= Section Bractearia.

Section EUCLITORIA DC., Prod. 2: 234. 1825 = Section Mexicana.

Section Flexuosa Fantz, sect. nov.

\*Section GLYCINOPSIS DC., Prod. 2: 235. 1825 = Periandra.

Section Mexicana Fantz, sect. nov.

Section Neurocarpum (Desv.) Benth., Journ. Linn. Soc. 2: 38.  
1858.

Section Tanystyloba Fantz, sect. nov.

ACUMINATA Benth., Ann. Wein. Mus. Natur. 2: 115. 1837 =  
amazonum.

ACUMINATA Grah. ex Wall., Cat. Herb. Ind. 186, no. 5346.  
1831-32 = macrophylla.

\*ALABAMENSIS Bertol., Misc. Bot. 9: 276. 1842 =  
Centrosema virginianum.

ALBA R. Brown, nom. in sched. = australis.

\*ALBA G. Don, Gen. Hist. Dich. Pl. 2: 115. 1832 = ?

ALBIFLORA Mattei, Boll. Bot. Palermo 6: 97. 1908 =  
ternatea.

AMAZONICA Mart. a Benth., nom. in sched. = amazonum.

amazonum Mart. ex Benth., Ann. Wein. Mus. Natur. 2: 115.  
1837.

f. amazonum

f. ROTUNDIFOLIA Rizz., Arq. Jard. Bot. Rio de Jan.  
17: 189. 1963 = f. amazonum.

f. vulgaris Fantz, f. nov.

AMOENA Miq., Nat. Verh. Holl. Mat. Wet. Haarl. 7: 24.  
1851 = arborescens.

\*AMOENA Roth., in Roemer Arch. 1(3): 42. 1798 =  
Centrosema virginianum.

andrei Fantz, sp. nov.

\*ANGUSTIFOLIA Nees & Mart., Nov. Act. Nat. Cur. 12: 29.  
1824 = Galactia martii.

\*AQUILUPENSIS Raeusch., Nom. Bot. Ed. 3. 210. 1797;  
orthogr. var. pro. QUADILUPENSIS scop. = ?

arborea Hoffm. ex Benth., Ann. Wein. Mus. Natur. 2: 115.  
1837.

var. arborea

var. longiramosa Fantz, var. nov.

var. pseudoamazonica Fantz, var. nov.

arborescens R. Brown, in Ait. Hort. Kew. ed. 2. 4: 302.  
1814.

australis Benth., Fl. Austral. 2: 242. 1864.

\*BERTERIANA DC., Prod. 2: 235. 1825 = Periandra bertiana.

\*BERTERIANA Vogel, Linnaea 10: 598. 1836 = Centrosema  
pubescens.

biflora Dalz., in Hook. Kew Journ. 2: 35. 1850.

brachycalyx Harms, in Fedde Repert. Spec. Nov. Regni Veg.  
17: 444. 1921.

brachystegia Benth., Bot. Voy. Sulph. 84. 1844.

BRACTEATA Poir., in Lam. Ency. Bot. Supp. 2: 301. 1811.

\*BRASILIANA Arrab., in Steudel Nom. Bot. ed. 2. 1: 386.  
1840 = Canavalia brasiliensis

\*BRASILIANA L., Sp. Pl. ed. 1. 753. 1753 = Centrosema  
brasilianum.

\*BRASILIANA Vell., Fl. Flum. 7: 312. 1825 = Canavalia.

\*BRASILENSIS Sessé & Moc., Fl. Mex. ed. 2. 172. 1894 = ?

\*BROUSSONETII Balbis, Cat. Stirp. 26. 1813 = Colognia  
broussonetii.

BURKARTII Rizz., Arq. Jard. Bot. Rio de Jan. 16: 155.  
1959 = densiflora.

CAJANIFOLIA (Presl.) Benth., in Mart. Fl. Bras. 15: 121.  
1862 = laurifolia.

var. LATIFOLIA Chod. & Hass., Bull. Herb. Boiss.  
4(2): 896. 1904 = densiflora.

f. GLABRIOR Benth., in Mart. Fl. Bras. 15(1): 121.  
1862 = laurifolia.

\*CALCARATA L'Heriti ex DC., Prod. 2: 235. 1825 =  
Centrosema plumieri.

\*CALCARIGERA Salis., Parad. Lond. t. 51. 1806 =  
Centrosema virginianum.

CANESCENS Pittier, nom. in sched. = canescens.

canescens Pittier ex Fantz, sp. nov.

\*CAPITATA Rich., Act. Soc. Nat. Hist. Par. 1: 111. 1792  
= Centrosema capitatum.

cavalcantae Fantz, sp. nov.

CEARENSIS Huber, Bull. Herb. Boiss. 1(2): 305. 1901 =  
falcata.

CERIFERA Cowan, Mem. Ny. Bot. Gard. 9: 349. 1957 =  
coriacea.

CHAPADENSIS Malme, Ark. Bot. Stockh. 23A(13): 82. 1931  
= guianensis.

\*COCCINEA Schrad., Goet. Gel. Anaz. 1: 717. 1821 =  
Periandra coccinea.

COELESTRIS Sieb. & Voss., in Vilmorin Blumen. 1: 208.  
1894 = ternatea.

cordiformis Fantz, sp. nov.

cordobensis Burk., Darwiniana 5: 61. 1941.

coriacea Schery, Fieldiana Bot. 28: 260. 1952.

\*DECUMGENS Mart., nom. in sched. = Centrosema decumbens  
Mart. ex Fantz, sp. nov.

dendrina Pittier, Cont. U.S. Nat. Herb. 20(3): 186. 1918.

densiflora (Benth.) Benth., Journ. Linn. Soc. 2: 41.  
1858.

var. MUCRONATA Hass., in Fedde Rep. Spec. Nov. 8:  
128. 1910 = densiflora

EMARGINATA Killip & Pittier, nom. in sched. = coriacea.

epetiolata Burk., Darwiniana 4: 88. 1949.

var. angustissima Hoehne ex Fantz, var. nov.

var. epetiolata.

var. latiuscula Burk., Darwiniana 8: 493. 1949.

ERECTA Roxb., Hort. Beng. 56. 1814 = laurifolia.

fairchildiana Howard, Bailey 15: 16. 1967.

falcata Lam., Ency. Meth. Bot. 2: 51. 1786.

\*FALCATA Nees, Flora Oder 4: 329. 1821 = Periandra coccinea.

FENDLERI Rusby, nom. in sched. = dendrina.

flagellaris (Benth.) Benth., Journ. Linn. Soc. 2: 39. 1858.

flexuosa Fantz, sp. nov.

var. brevibracteola Fantz, var. nov.

var. flexuosa.

\*FLUMIENSIS Vell., Fl. Flum. 7: 312. 1825 = Centrosema plumieri.

\*FORMOSA H.B.K., Nov. Gen. Sp. 6: 417. 1824 = Centrosema brasilianum.

fragrans Small, Torreya 26: 57. 1926.

froesii Fantz, sp. nov.

\*FULGENS Paxt., Mag. Bot. 11: 121. 1844 = Collaea scarlatina.

\*GALACTEA Crantz, Inst. Rei Herb. 2: 60. 1766 = Galactia ?

\*GALACTIA L., Sp. Pl. ed. 2. 1763 = Galactia pendula.

\*GEMINA Vell., Fl. Flum. 7: 313. 1825 = Centrosema virginianum.

\*GLABELLA Desf., Tabl. Bot. ed. 1. 192. 1804; nom. nud. = Galactia glabella ?



glaberrima Pitt., Bol. Soc. Venez. Cien. Nat. 8(56):  
264. 1943.

\*GLABRE Desf., Tabl. Bot. ed. 1. 192. 1804; nom. nud. =  
Galactia glabella ?

\*GLADIATA Schrank, Syll. Ratisb. 1: 229. 1824 =  
Centrosema virginianum.

\*GLOMERATA Griseb., Cat. Pl. Cuba 74. 1866 = Galactia  
jussiaeana.

GLYCINOIDES DC., Prod. 2: 234. 1825 = falcata.

var. AURANTIACA Benth., in Mart. Fl. Bras. 15: 119.  
1862 = falcata.

var. ECOSTATA Urb., in Duss. Fl. Ph. Ant. Fr. 208.  
1897; nom. nud. = falcata.

var. GUARANTIACA Chod. & Hass., Bull. Herb. Boiss.  
4: 895. 1904 = falcata.

var. MEGAPOTAMICA Malme, Ark. Bot. Stockh. 23A(13):  
32. 1931 = falcata.

f. HETEROMORPHA Griseb., Cat. Cuba 74. 1866 =  
falcata.

f. LATIFOLIA Rizz., nom. in sched. = falcata.

GRAHAMII (GRAHAMI) Steud., Nom. Bot. ed. 2. 1: 86.  
1840; nom. nud. = macrophylla.

GRAHAMII (GRAHAMI) Steud. ex Benth., in Junghuhn Pl.  
Jungh. 2: 232. 1852 = mariana (p.p. maj.) and  
macrophylla (p.p. min.).

\*GRANDIFLORA Mart. & Gal., Bull. Acad. Brux. 10: 189.  
1843 = Centrosema grandiflora (Mart. & Gal.) Fantz,  
comb. nov.

GRANDIFOLIA Ducke, Arq. Jard. Bot. Rio de Jan. 5: 141.  
1930 = javitensis.

\*GUADALUPENSIS Scop., orthogr. err. pro. QUADALUPENSIS = ?  
guianensis (Aubl.) Benth., Journ. Linn. Soc. 2: 40. 1858.

var. chapadensis (Malme) Fantz, stat. nov.

var. guianensis.

- f. guianensis.
- f. imperfecta Fantz, f. nov.
- f. microfructa Fantz, f. nov.
- f. unifoliata Fantz, f. nov.
- var. macrocleistogma Fantz, var. nov.
- var. SUBSESSILIS (Rose) Croat, Phytologia 29(2): 131. 1974 = var. guianensis f. guianensis.
- f. CHAPADENSIS (Malme) Rizz., Arq. Jard. Bot. Rio de Jan. 17: 184. 1963 = var. chapadensis.
- GUYANENSIS (Aubl.) Benth., in Mart. Fl. Bras. 15: 121. 1862 = guianensis.
- f. ANGUSTISSIMA Hoehne, nom. in sched. = epetiolata var. angustissima.
- hanceana Hemsl., Journ. Linn. Soc. 23: 187. 1887.
- var. hanceana.
- var. latifolia Fantz, var. nov.
- var. laureola Gagn., in Lecomte Fl. Indo-Chine 2: 313. 1916 (p.p. maj.).
- var. LAUREOLA Gagn., l.c. p.p. min. = var. petiolata.
- var. petiolata Fantz, var. nov.
- var. thailanensis Fantz, var. nov.
- hermannii Fantz, sp. nov.
- heterophylla Lam., Ency. Meth. Bot. 2: 51. 1786.
- var. heterophylla.
- var. pedunculata (Bojer ex Benth.) Fantz, comb. nov.
- HOFFMANSEGGII Benth., Journ. Linn. Soc. 2: 42. 1858 = arborea.
- humilus Rose, Cont. U.S. Nat. Herb. 5(4): 169. 1899.
- \*INSULANA Arrab., in Steud. Nom. Bot. ed. 2 1: 386. 1840; nom. nud. = ?

\*INSULANA Vell., Fl. Flum. 7: 313. 1825 = Centrosema  
brasilianum.

irwini Fantz, sp. nov.

javanica Miq., Fl. Ind. Bat. 1: 226. 1855.

javitensis (H.B.K.) Benth., Journ. Linn. Soc. 2: 42.  
1858.

var. GLABRA Sagot, Am. Soc. Nat. Bot. 13: 299. 1882 =  
sagotii.

var. grandifolia (Ducke) Fantz, comb. nov.

var. javitensis.

f. bracteosubtenda Fantz, f. nov.

f. javitensis.

var. klugii Fantz, var. nov.

var. longiloba Fantz, var. nov.

var. portobellensis (Beurl.) Fantz, comb. nov.

f. pilosa Fantz, f. nov.

f. portobellensis

f. truncata Fantz, f. nov.

juninensis Fantz, sp. nov.

kaessneri Harms, Engl. Jahrb. 49: 440. 1913.

kaieteurensis Fantz, sp. nov.

\*LACTESCENS L., Syn. Nat. 1172. 1758 = Galactia pendula.

LANCEA Clayton (?), nom. in sched. = mariana.

LASCIVA Boj., Hort. Maurit. 92. 1837; nom. nud. =  
lasciva.

lasciva Boj. ex Benth., Ann. Wein. Mus. Natur. 2: 114.  
1837.

LAUREOLA Gagn., nom. in sched. = hanceana.

\*LAURIFOLIA Desv., Ann. Sci. Nat. Ser. I. 9: 411. 1826 =  
Centrosema vexillatum.

laurifolia Poir., in Lam. Ency. Supp. 2: 301. 1811.

f. fasciculata Fantz, f. nov.

f. glabrior Fantz, comb. nov.

f. laurifolia.

f. parvifolia (Pittier) Fantz, comb. nov.

f. petiolata Fantz, f. nov.

leptostachya Benth., Journ. Linn. Soc. 2: 43. 1858.

var. fruticosa Fantz, var. nov.

var. leptostachya.

linearis Gagn., in Lecompte Nat. Syst. 3: 108. 1915.

MACROPHYLLA Hance, Journ. Bot. 9. 1878 = hanceana.

MACROPHYLLA Wall., Cat. Herb. Ind. 186, no. 5345.  
1831-32; nom. nud. = macrophylla.

macrophylla Wall. ex Benth., in Junghuhn Pl. Jungh. 2:  
232. 1852.

var. macrophylla.

var. sericea Fantz, var. nov.

var. stipulacea Fantz, var. nov.

mariana L. Sp. Pl. ed. 1. 753. 1753.

var. mariana.

f. mariana.

f. pedunculata Fantz, f. nov.

f. pubescentia Fantz, f. nov.

var. orientalis Fantz, var. nov.

\*MARIANA Moc. & Sessé ex DC., Prod. 2: 238. 1825 =  
Galactia radicata.

MARIANA Schlecht. ex Benth., Ann. Wein. Mus. Natur. 2:  
115. 1837; pro syn. = mexicana.

MEARNSII DeWild., Rev. Zool. Afr. 13, Bot. Supp. Bot.  
8: 8. 1925 = ternatea.

mexicana Link., Enum. Hort. Berol. 2: 235. 1821.

\*MEXICANA Moc et Steudel, Nom. Bot. ed. 2. 1: 386. 1840;  
nom. nud. = ?

\*MEXICANA Steud., l.c. 2: 193. 1840; nom. nud. = ?

\*MICRANTHA Guill. & Perr., Fl. Seneg. Tent. 1(5): 190.  
1832 = ?

\*MICRANTHA Smith ex Steud., Nom. Bot. ed. 2. 1: 386.  
1840; nom. nud. = Centrosema virginianum.

\*MICRANTHA Scop., Delic. Fl. Insub. 2: 1. 1786 =  
Galactia longifolium.

monticola Brandegee, Univ. of Calif. pub. Bot. 6: 500.  
1919.

moyobambensis Fantz, sp. nov.

MULTIFLORA Mart. & Gal., Bull. Herb. Boiss. 10: 188.  
1843 = polystachya.

\*MULTIFLORA Swartz, Nov. Gen. & Pl. Ind. Occ. 106. 1788 =  
Vilmorinia multiflora.

nana Benth., Journ. Linn. Soc. 2: 40. 1858.

var. caaguazuensis Hass., in Fedde Rep. Spec. Nov.  
8: 128. 1910.

var. nana.

nervosa Herzog, in Fedde Rep. Sp. Nov. 7: 56. 1909.

obidensis Huber, Bol. Mus. Goeldi Pará 5: 405. 1909.

\*OBLONGA Hassk., Flora Oder 25(2:4) 48. 1842 =  
Centrosema virginianum.

\*OCCIDENTALIS Sweet, Hort. Bot. ed. 2. 140. 1830 =  
Centrosema virginianum.

PARVIFLORA Pittier, Bol. Tech. Ministr. Agric. Caracas  
5: 49. 1944 = laurifolia.

PARVIFLORA Rafin., Atl. Journ. 1(4): 147. 1832 =  
ternatea.

PEDUNCULATA Boj. ex Benth., Ann. Wein. Mus. Natur. 2:  
114. 1837.

\*PEDUNCULATA Michelli, Kjoeb. Vidensk. Meddel. 77.  
1875 = ?

pendens Fantz, sp. nov.

\*PHRYNE Conners ex Steud., Nom. Bot. ed. 1. 1: 386.  
1840 = ?

\*PHRYNE Juss. ex Don, Dich. Host. Pl. 2: 218. 1832;  
pro. syn. = Galactia sericea.

PINETORUM McFarlin, nom. in sched. = fragrans.

PINNATA, nom. in sched. = ternatea.

PILOSULA Wall., Cat. Herb. Ind. 186, no. 5347. 1831-32;  
nom. nud. = ternatea.

PILOSULA Wall. ex Benth., Journ. Linn. Soc. 2: 37.  
1858 = ternatea.

\*PLUMIERI Turp., in Pers. Syn. 2: 312. 1807 = Centrosema  
plumieri.

\*PLUMIERI Tuss., Fl. Ant. 4: 79. 1827 = Centrosema sp.

plumosa Fantz, sp. nov.

POITAEI DC., Prod. 2: 234. 1825 = arborescens.

POITAEI Dec. ex Steud., Nom. Bot. ed. 1. 1: 386. 1840;  
err. cit. pro POITAEI DC. = arborescens.

POITAEI Benth., Ann. Wein. Mus. Natur. 2: 115. 1837;  
err. cit. pro POITAEI DC. = arborescens.

POITAEI DC.; orthogr. err. pro POITAEI DC. = arborescens.

POITEAUI DC; orthogr. err. pro POITAEI DC. = arborescens.

\*POLYPHYLLA Poir., in Lam. Ency. Supp. 2: 300. 1811 =  
Barbieria polyphylla.

polystachya Benth., Pl. Hartw. 60. 1840.

var. congesta Fantz, var. nov.

var. polystachya.

PORTOBELLENSIS Beurl., Vet. Akad. Handl. Stockh. 119.  
1854 = javitensis.

pozuzoensis Macbride, Pub. Field. Mus. Nat. Hist. Bot.  
8: 103. 1930.

var. pozuzoensis.

f. pozuzoensis.

f. subpalmata Fantz, f. nov.

var. schunkei Fantz, var. nov.

PROSTRATA Spruce, nom. in sched. = sagotii.

\*PUDICA Steud., Nom. Bot. ed. 2. 1: 386. 1840; nom. nud. = ?

\*QUADALUPENSIS Scop., Delic. Insub. 2: 4. 1786 = ?

RACEMOSA Benth., Ann. Wein. Mus. Natur. 2: 115. 1837 = fairchildiana.

f. OBOVATIFOLIA Rizz., Arq. Jard. Bot. Rio de Jan. 17: 190. 1963 = fairchildiana.

\*RACEMOSA Don, Gen. Hist. Dich. Pl. 2: 115. 1832 = Vigna racemosa.

\*RACEMOSA Moc. & Sessé ex DC., Prod. 2: 235. 1825; pro syn. = Centrosema plumieri.

\*RACEMOSA Moc. & Sessé ex Don, Gen. Hist. Dich. Pl. 2: 216. 1832; pro syn. = Centrosema plumieri.

\*RACEMOSA Sessé & Moc., Pl. Nov. Hist. ed. 1. 124. 1887 = ?

\*RIANDRA Frag. & Clif. Bol. Real Soc. Esp. Hist. Nat. 25: 358. 1925; orthog. err. pro TRIANDRA = portion of a Latin phrase describing the host of a fungus, not intended as a new name.

\*ROTUNDIFOLIA Sessé & Moc., F. Mexico ed. 2. 172. 1894 = ?

RIBIGINOSA Juss. ex Pers., Syn. 2: 312. 1807 = falcata.

var. ECOSTATA (Urb.) Stehlé, Bull. Agr. Mart. 4(3/4): 259. 1937; nom. nud. = falcata.

var. ECOSTATA (Urb.) Stehlé, in Stehlé & Quentin Fl. Guad. & Dep. 107. 1948; nom. nud. = falcata.

var. GENUINA Stehlé & Quentin, l.c. 106. 1948; nom. nud. = falcata.

var. GLABRESCENS Vedrc., Kew Bull. 24(2): 253. 1970 = falcata.

RUBIGINOSA Pers.; err. cit. pro RUBIGINOSA Juss. ex  
Pers. = falcata.

\*RUBIGINOSA Nees & Mart., Nov. Act. Nat. Cur. 12: 29.  
1824 = Galactia neesii.

RUFESCENS (Benth.) Benth., Journ. Linn. Soc. 2: 39.  
1858 = falcata.

sagotii Fantz, sp. nov.

var. caniculata Fantz, var. nov.

var. sagotii.

var. sprucei Fantz, var. nov.

\*SCHIEDEANA Schlecht., Linnaea 12: 284. 1838 = Centrosema  
pubescens.

selloi Benth., Journ. Linn. Soc. 2: 42. 1858.

\*SERICEA Watson, Proc. Am. Acad. 22: 407. 1887 =  
Tephrosia watsoniana.

SERRULATA B.G., nom. in sched. = ternatea.

simplicifolia (Kunth) Benth., Journ. Linn. Soc. 2: 40.  
1858.

\*SINUATA Nees ex Desv., Ann. Sci. Nat. Ser. 1: 412.  
1826 = Centrosema sinuatum.

\*SNETHLAGEAE Ducke, Arch. Jard. Bot. Rio de Jan. 3: 165.  
1922 = Centrosema snethlageae (Ducke) Fantz, comb.  
nov.

\*SPECIOSA Cav., Desc. Pl. 182. 1802 = Centrosema  
speciosum.

SPECTABILIS Salisb., Prod. Stirp. 336. 1796 = ternatea.

\*STANS Delic., nom. in sched. = Centrosema stans Delic.  
ex Fantz, sp. nov.

stipularis Benth., Journ. Linn. Soc. 2: 41. 1858.

var. latifolia (Rizz.) Fantz, stat. nov.

var. stipularis.

f. LATIFOLIA Rizz., Arq. Jard. Bot. Rio de Jan.  
17: 181. 1963 = var. latifolia.



SUBSESSILIS Rose, Cont. U.S. Nat. Herb. 5(4): 169.  
1899 = guianensis.

\*SUBUMBELLATA Salzmann, nom. in sched. = Centrosema  
subumbellata salzem. ex Fantz, sp. nov.

TANGANICENSIS Micheli in Dur. & Dewild., Bull. Soc.  
Roy. Bot. Belg. 36(2): 60. 1897 = ternatea.

TANGANYICENSIS Micheli ex Baker, Leg. Trop. Afr. 429.  
1929 = ternatea.

ternatea L., Sp. Pl. ed. 1. 753. 1753.

var. ALBA Berh., Fl. Seneg. 47. 1954 = var.  
ternatea f. albiflora.

var. ALBA Sweet, Hort. Brit. ed. 2. 140. 1830;  
nom. nud. = var. ternatea f. albiflora.

var. ALBIFLORA Voigt., Hort. Calcut. 213. 1845 =  
var. ternatea f. albiflora.

var. ANGUSTIFOLIA Hochst., nom. in sched. = var.  
angustifolia.

var. angustifolia Hochst. ex Bak. f., Leg. Trop.  
Afr. 428. 1929.

var. BRACTEATA (Poir.) DC., Prod. 2: 234. 1825 =  
var. ternatea f. albiflora.

var. COERULEO Sweet, Hort. Brit. Ed. 2. 140. 1830;  
nom. nud. = var. ternatea f. ternatea.

var. MAJOR Burnett, Pl. Util. 2: 84. 1847 =  
var. ternatea f. ternatea.

var. PILOSULA (Wall. ex Benth.) Bak., in Hook. Fl.  
Brit. Ind. 208. 1879 = var. ternatea f.  
albiflora.

var. pleniflora Fantz, var. nov.

f. leucopetala Fantz, f. nov.

f. pleniflora.

f. subpolyadelpha Fantz, f. nov.

var. STENOPHYLLA Welw., nom. in sched. = var.  
ternatea f. ternatea.

var. ternatea.

f. albiflora (Voigt) Fantz, stat. nov.

f. pauciflora Fantz, f. nov.

f. fasciculata Fantz, f. nov.

f. ternatea.

TERNATENSIMUM Crantz, Inst. Rei. Herb. 59. 1766 =  
ternatea.

TETRAGONA Poir., nom. in sched. = falcata.

TETRAGONA Poir, ex DC., Prod. 2: 236. 1825; pro syn.  
= falcata.

TETRAGONA Vahl., nom. in sched. = falcata.

TIMORIANA, nom. in sched. = ternatea.

\*TOMENTOSA Nees & Mart., Nov. Act. Nat. Cur. 12: 30.  
1824 = Galactia tomentosa.

\*TRIANDRA Frag. & Cif., Bol. Real. Soc. Esp. Hist Nat.  
25: 359, 367, 455, 456, & 515. 1925 = portion of a  
Latin phrase describing fungal host, not intended  
as a new name.

\*TRICOLOR Ducke, nom. in sched. = Centrosema snethlageae.

\*TRISTIS Tenore, Cat. Hort. Neap. 82. 1845 = ?

tunuhiensis Fantz, sp. nov.

\*UIRGINIANA Sessé & Moc., Pl. Nov. Hisp. ed. 1. 124.  
1887; orthogr. err. pro, VIRGINIANA Sessé & Moc. =  
Centrosema?

VELUTINA Standl., Pub. Field Mus. Nat. Hist. Ser. Bot.  
22: 24. 1940 = polystachya.

\*VICIOIDES Nees & Mart., Nov. Act. Cur. 12: 28. 1824 =  
Coursetia vicioides.

\*VIRDIFLORA Bouton ex Hook., Icon. Plan. 11. 1837 =  
Dolichos axillaris.

\*VIRGINIANA L., Sp. Pl. Ed. 1. 753. 1753 = Centrosema virginianum.

\*VIRGINIANA Sessé & Moc., Pl. Nov. Hisp. Ed. 2. 116.  
1893 = Centrosema?

woytkowski Fantz, sp. nov.

ZANZIBARENSIS Vatke, Oestr. Bot. Zeitschr. 28: 261.  
1878 = ternatea.

\*ZOOPTHALMUM L., Syst. Nat. ed. 10. 1172. 1758 =  
Dolichos urens?

Centrosema (DC). Benth. = non Clitoria.

SPICATA Glazious, Bull. Soc. Bot. France 53, Mem. 36: 135. 1960;  
nom. nud. = Clitoria fairchildiana.

CLYTORIA Presl, Rostl. 3: 196. 1835 = Clitoria L.

Crotalaria L. = non Clitoria.

ELLIPTICA Poir. ex DC., Prod. 2: 236. 1825; pro syn. = falcata.

ELLIPTICA Poir., nom. in sched. = falcata.

GAJANENSIS Desv., Journ. Bot. 1: 119. 1813 = Clitoria laurifolia.

GUIANENSIS Aubl., Hist. Pl. Fr. Guian. 761. 1775 = Clitoria  
guianensis.

GUYANENSIS Aubl. ex Desv., Journ. Bot. 2: 75. 1814 = Clitoria  
laurifolia.

LONGIFOLIA Lam., Ency. Meth. Bot. 2: 201. 1786 = Clitoria  
guianensis.

MACROTRULLION Klotzsch ex Schomb., Br. Guiana Fauna & Flora 1202.  
1848 = Clitoria L.

ELEGANS Schomb. l.c. = ?

SPLENDENS Klotzsch, l.c. = ?

MARTIA Leandr.-Scar., Denkschr. Akad. Muench. 7: 238. 1821 =  
Clitoria L.

\*BRASILIENSIS Zucc. ex Steud., Nom. Bot. ed. 2. 2: 104. 1841;  
nom. nud. = ?

\*MEXICANA Zucc., Abh. Akad. Muench. 1: 339. 1832 = ?

PHYSODES Leandr.-Sacr., Denkschr. Akad. Muench. 7: 238.  
1821 = Clitoria falcata.

MARTIUSIA Schult., Mant. 1: 69. 1822 = Clitoria L.

FRAGRANS (Small) Small, Manual of S.E. Fl. 722. 1933 =  
Clitoria fragrans.

LAURIFOLIA (Poir.) Britton, Sc. Sur. P. Rico & Vir. Is. 5:  
412. 1924 = Clitoria laurifolia.

MARIANA (L.) Small, l.c. = Clitoria mariana.

RUBIGINOSA (Juss. ex Pers.) Britton, Sc. Sur. P. Rico & Vir.  
Is. 5: 411, 1924 = Clitoria falcata.

PHYSALODES Schult., Mant. 1: 69. 1822 = Clitoria falcata.

NAUCHEA Desc., Mem. Soc. Linn. Par. 4: 7. 1826 = Clitoria L.

\*BOUCLIER Desc., Des. Ant. 8: 343. 1829 = Centrosema Sp.?

BRACTEATA Dupuis ex Desc., Mem. Soc. Linn. Par. 4: 11. 1826 =  
Clitoria ternatea.

\*BRASILIANA (L.) Desc., l.c. 4: 9. 1826 = Centrosema  
brasiliana.

\*CLYPEATA Pritz, Ic. Ind. 1: 738. 1835 = Centrosema sp. ?

\*FALCATA Desc., Mem. Soc. Linn. Par. 4: 9. 1826 = Periandra  
coccinea.

HETEROPHYLLA Desc., l.c. 4: 8. 1826 = Clitoria heterophylla.

\*LAURIFOLIA Ledru ex Desc., l.c. 4: 11. 1826 = Centrosema  
vexillatum.

MARIANA (L.) Desc., l.c. 4: 9. 1826 = Clitoria mariana.

\*MULTIFLORA Swartz ex Desc., l.c. 4: 10. 1826 = Vilmorinia  
multiflora.

\*PLUMIERI Pers. ex Desc., l.c. 4: 12. 1826 = Centrosema  
plumieri.

\*POLYPHYLLA Ledru ex Desc., l.c. 4: 10. 1826 = Barbieria  
polyphylla.

\*PUDICA Desc., l.c. 4: 12. 1826 = ?

RUBIGINOSA Juss. ex Desc., l.c. 4: 12. 1826 = Clitoria  
falcata.

TERNATEA (L.) Desc., l.c. 4: 8. 1826 = Clitoria ternatea.

\*VIRGINIANA (L.) Desc., l.c. 4: 9. 1826 = Centrosema virginianum.

NEUROCARPUM Desv., Journ. Bot. 1: 119. 1813 (Neurocarpon Desv. ex Ham., Prod. Pl. Ind. Occ. 50. 1825; Neurocarpus Desv. ex Hassk., Cat. Hort. Bogor. Alt. 276, no. 1226. 1844) = Clitoria L.

ANGUSTIFOLIUM Kunth, Mimos. 218. 1824 = Clitoria guianensis.

ARGENTUM Duch. & Walp., Flora Oder 36: 228. 1853 = Clitoria falcata.

\*BARBATUM Nees ex Desv., Ann. Sci. Nat. Ser. 1. 9: 1826 = ?

BLANCHETIANUM D.C., nom. in sched. = Clitoria laurifolia.

BLANCHETIANUM Moricand, nom. in sched. = Clitoria laurifolia.

BRACATEATUM Mart. ex Benth., Ann. Wein. Mus. Natur. 2: 116. 1837 = Clitoria stipularis.

CAJANIFOLIUM Presl, Symb. Bot. 1: 17. 1832 = Clitoria laurifolia.

CAMPESTRE Mart., nom. in sched. = Clitoria guianensis.

DENSIFLORUM Benth., l.c. 2: 117. 1837 = Clitoria densiflora.

f. ERECTUM Benth., nom. in sched. = Clitoria densiflora.

ELLIPTICUM Desv., Journ. Bot. 1: 75. 1813, nom. nud.; l.c. 2: 119. 1814 = Clitoria falcata.

EMARGINATUM Moricand, nom. in sched. = Clitoria laurifolia.

ERECTUM Voigt, Hort. Sub. Calcut. 213. 1845 = Clitoria laurifolia.

FALCATUM (Lam.) DC., Prod. 2: 236. 1825 = Clitoria falcata.

FLAGELLARE Benth., in Hook. Journ. Bot. 2: 58. 1840 = Clitoria flagellaris.

FRIGIDULUM Mart. ex Benth., Ann. Wein. Mus. Natur. 2: 116. 1837 = Clitoria guianensis.

GLYCINOIDES (DC.) Desv., Ann. Sci. Natur. Set. 1. 9: 413. 1826 = Clitoria falcata.

- GAJANENSIS Desv., Journ. Bot. 1: 119. 1813; nom. nud. = Clitoria laurifolia.
- JANENSIS Desv., Journ. Bot. 2: 75. 1814 = Clitoria laurifolia.
- JAVITENSE H.B.K., Nov. Gen. Sp. 6: 409. 1824 = Clitoria javitensis.
- LAURIFOLIUM (Poir.) Desv. ex Ham., Prod. Pl. Ind. Occ. 51. 1825 = Clitoria laurifolia.
- LONGIFOLIUM Mart. ex Benth., Ann. Wein. Mus. Natur. 2: 116. 1837 = Clitoria guianensis.
- MACROPHYLLUM H.B.K., Nov. Gen. Sp. 6: 410. 1824 = Clitoria dendrina?
- \*MEXICANUM (Zucc.) Steud., Nom. Bot. ed. 2. 2: 193. 1841 = ?
- \*MULTIFLORUM Hook. & Arn., Bot. Voy. Beech. 286. 1841 = Canavalia?
- RACEMOSUM Pohl., nom. in sched. = Clitoria fairchildiana.
- RESUPINATUM Bunb., Proc. Linn. Soc. 1: 110. 1841 = ?
- RETUSUM Hassk., Cat. Hort. Bog. Alt. 276. 1844 = Clitoria laurifolia.
- RUBIGINOSUM (Pers.) Desv. ex Ham., Prod. Pl. Ind. Occ. 51. 1825 = Clitoria falcata.
- RUFESCENS Benth., Ann. Wein. Mus. Natur. 2: 116. 1837 = Clitoria falcata.
- SIMPLICIFOLIUM Kunth, Mimos. 213. 1825 = Clitoria simplicifolia.
- \*SPECIOSUM Klotzsch, in Schomb. Fauna & Fl. Guian. 1202. 1848 = ?
- VILLOSUM Desv., Ann. Sci. Nat. Ser. 1. 9: 413. 1826 = Clitoria falcata.
- RHOMBIFOLIUM Rich ex DC., Prod. 2: 235. 1825; pro syn. = Clitoria L.
- CANESCENS Rich. ex DC., Prod. 2: 236. 1825; pro syn. = Clitoria guianensis.
- RHOMBOLOBIUM Rich. ex H.B.K., Nov. Gen. Sp. 6: 406. 1824; pro syn. = Clitoria L.
- OVATUM Rich., nom. in sched. = Clitoria falcata.

TERNATEA Tourn. ex Mill., Gard. Dict. ed. 4. 3: TERNATEA. 1754  
(TERNATEA Tourn. ex H.B.K., Nov. Gen. Sp. 6: 415. 1824.) =  
Clitoria L.

AMAZONUM (Mart. ex Benth.), Kuntze, Riv. Gen. Pl. 1: 210.  
1891 = Clitoria amazonum.

ARBOREA (Benth.) Kuntze, l.c., = Clitoria arborea.

ARBORESCENS (Ait.) Kuntze, l.c. = Clitoria arborescens.

AUSTRALIS (Benth.) Kuntze, l.c. = Clitoria australis.

BIFLORA (Dalz.) Kuntze, l.c. = Clitoria biflora.

BRACHYSTEGIA (Benth.) Kuntze, l.c. = Clitoria brachystegia.

BRACTEATA (Mart. ex Benth.) Kuntze, l.c. = Clitoria stipularis.

DENSIFLORA (Benth.) Kuntze, l.c. = Clitoria densiflora.

FLAGELLARIS (Benth.) Kuntze, l.c. = Clitoria flagellaris.

GLYCINOIDES (DC.) Kuntze, l.c. = Clitoria falcata.

\*GRANDIFLORA (Mart. & Gal.) Kuntze, l.c. = Centrosema grandiflora.

GUIANENSIS (Aubl.) Kunth., l.c. = Clitoria guianensis.

HANCEANA (Hemsley) Kuntze, l.c. = Clitoria hanceana.

HETEROPHYLLA (Lam.) Kuntze, l.c. = Clitoria heterophylla.

HOFFMANNSEGGII (Benth.) Kuntze, l.c. = Clitoria arborea.

JAVITENSIS (H.B.K.) Kuntze, l.c. = Clitoria javitensis.

LASCIVA (Boj. ex Benth.) Kuntze, l.c. = Clitoria lasciva.

LEPTOSTACHYA (Benth.) Kuntze, l.c. = Clitoria leptostachya.

LAURIFOLIA (Poir.) Kuntze, l.c. = Clitoria laurifolia.

MACROPHYLLA (Wall.) Kuntze, l.c. = Clitoria macrophylla.

MARIANA (L.) Kuntze, l.c. = Clitoria mariana.

MULTIFLORA (Mart. & Gal.) Kuntze, l.c. = Clitoria polystachya.

NANA (Benth.) Kuntze, l.c. = Clitoria nana.

PEDUNCULATA (Boj.) Kuntze, l.c. = Clitoria heterophylla.

- POLYSTACHYA (Benth.) Kuntze, l.c. = Clitoria polystachya.
- PORTOBELLENSIS (Beurl.) Kuntze, l.c. = Clitoria javitensis.
- RACEMOSA (Benth.) Kuntze, l.c. = Clitoria fairchildiana.
- RUBIGINOSA (Pers.) Kuntze, l.c. = Clitoria falcata.
- RUFESCENS (Benth.) Kuntze, l.c. = Clitoria falcata.
- \*SCHIEDEANA (Schlect.) Kuntze, l.c. = Centrosema pubescens.
- SELLOI (Benth.) Kuntze, l.c. = Clitoria selloi.
- SIMPLICIFOLIA (Benth.) Kuntze, l.c. = Clitoria simplicifolia.
- VULGARIS H.B.K., Nov. Gen. Sp. 6: 4.5. 1824 = Clitoria ternatea.
- VEXILLARIA Eaton, in Ree's Cyclopaedia. 1807 = Clitoria L.
- MARIANA (L.) Eaton, Man. Bot. 82. 1817 = Clitoria mariana.
- \*PLUMIERI (Turp.) Eaton l.c. = Centrosema plumieri.
- \*VIRGINIANA (L.) Eaton, l.c. = Centrosema virginianum.
- VEXILLARIA Hoffm. = Centrosema (DC) Benth.
- ARBOREA Hoffm., Ann. Wein Mus. Natur. 2: 115. 1837; pro syn.  
= Clitoria arborea.
- VEXILLARIA Raf., Amer. Monthly Mag. & Crit. Rev. 2: 268, no. 111.  
Clitoria L.
- MARIANA Raf., l.c. = Clitoria mariana.



## PHYLOGENETIC CONSIDERATIONS

A discussion of evolution within Clitoria must proceed from a data base that is incomplete, as data are scant or absent in most areas, such as anatomy, cytology, and palynology. Morphological information on species of Clitoria presented in this study represent nearly the only available data, and any phylogenetic scheme based solely upon evolutionary interpretations of morphology will certainly contain errors. Similarity of morphological characters may indicate evolutionary relationships and a common ancestor, or such data may represent convergent evolution. Relationships between certain species are often evident, but similarity in structures does not necessarily reflect close phylogenetic kinship.

Keys presented in this study often have incorporated a number of characters at each couplet (i.e. vegetative, fruiting, and flowering data) for easy identification of new collections to the genus. However, the keys were also designed to incorporate relationships and place closely related species near each other. Species have been ordered within a framework which may be interpreted as being along phylogenetic lines.

Traits within the genus Clitoria considered to be more reliable in interpreting phylogenetic relationships are those traits typically regarded as primitive in other genera (e.g., woody habit, large seeds, foliaceous bracteoles) as well as those traits which appear to have

been derived from a pre-existing structure (e.g., costate fruits, viscid seeds, cleistogamous flowers). The woody subgenus Bractearia has the largest number of primitive characteristics, and thus is more similar to the ancestral stock. Subgenus Clitoria exhibits a mixture of primitive and advanced traits, whereas subgenus Neurocarpum has a large number of advanced characteristics and represents the subgenus that has diverged farthest from the ancestral stock. Those characters which are associated with subgenus Bractearia, and differ in one or both of the other two subgenera, are considered to be primitive traits (e.g., multinerved calices, woody inflorescences, flat legumes), in accord with the principle that primitive characters are frequently associated with other primitive characters. A pattern of reduction is often observed when certain structures found within the primitive subgenus are compared with those of the advanced subgenera, whereas other structures follow both subgeneric and sectional lines from the more primitive to the more advanced taxon (e.g., reduction in size of the legume and petiole, reduction in the number of flowers per inflorescence).

#### Evolutionary Trends in Clitoria

Many of the standard taxonomic references include a list of phylogenetic characters and guiding principles to be used in the determination of probable evolutionary pathways within a group of plants. Radford et al. (1974) incorporated and summarized the concept of many earlier systematists who have been recognized as authorities in the area of evolutionary botany. Phylogenetic interpretations presented for the genus Clitoria reflect these principles as well as

those expressed by others. Evolutionary trends within the genus Clitoria are summarized in Table 15.

#### The General Plant Structure

Woody species characteristic of members of subgenus Bractearia are considered more primitive than the subshrubs and suffrutescent herbs characteristic of subgenera subgenus Bractearia; trees and tall shrubs characteristic of sections Bractearia and Brachycalyx are considered more primitive than the lianas which exhibit the advanced trait of a climbing habit, characteristic of sections Flexuosa and Cauliflorae. In the more herbaceous subgenera, the few shrub species exhibit the primitive trait, whereas the herbaceous vines exhibit the advanced trait. Most species are subshrubs, bearing sublignose erect stems which may or may not have a climbing apex, and exhibit an intermediate trait. Although each section has members which exhibit the primitive, intermediate, or advanced state, most species of the section Neurocarpum exhibit the intermediate to advanced condition.

Evergreen plants are considered to be more primitive than deciduous-leaved plants. Although the term evergreen has never been applied to the genus Clitoria, species of the section Brachycalyx are frequently reported by the collectors to have leaves that are seasonally deciduous, with the flowers preceding the new set of leaves. This distinct reproductive and vegetative season is considered to be an advanced condition.

The absence of a taproot is considered to be an advanced condition. Members of the subgenus Clitoria exhibit either a slender taproot or two to four slender roots from which rootlets appear. An advanced trait is exhibited in subgenus Neurocarpum in which the

Table 15. Evolutionary trends in Clitoria.

PRIMITIVE	ADVANCED
Tropical plants	Subtropical, temperate plants
Trees, tall shrubs	Subshrubs, suffrutescent herbs
Taproot system	Xylopodium system
Stem erect	Stem climbing
Stem nearly straight	Stem zigzag
Leaves evergreen	Leaves deciduous
Leaves pinnate	Leaves digitate
Leaves long-petiolate	Leaves subsessile or sessile
Leaves 5- to 11-foliate	Leaves 3- and 1-foliate or only 1-foliate
Leaflets large	Leaflets small
Leaflet apex acuminate	Leaflet apex retuse to emarginate
Stipules persistent	Stipules deciduous
Stipels persistent	Stipels caducous
Petioles elongate	Petioles short to nearly lacking
Petioles longer than rachis	Petioles shorter than rachis
Inflorescence woody	Inflorescence herbaceous
Inflorescence axillary, terminal	Inflorescence cauliflorous
Inflorescence a panicle, subpanicle	Inflorescence a raceme or bearing flowers at apex of peduncle
Inflorescence multiflowered	Inflorescence 2-flowered
Inflorescence nearly straight to arcuate	Inflorescence zigzag
Peduncle elongate	Peduncle nearly lacking
Flowers large	Flowers small

Table 15 - continued

PRIMITIVE	ADVANCED
Cleistogamous flowers absent	Cleistogamous flowers present
Flowers papilionaceous	Flowers actinomorphic
Bracteoles large, foliaceous	Bracteoles small
Calyx tube multinerved	Calyx tube prominently 5- or 10-nerved
Calyx infundibular	Calyx cup-shaped
Calyx tube long	Calyx tube short
Calyx lobes elongate	Calyx lobes minute to nearly lacking
Calyx lobes shorter than tube length	Calyx lobes longer than tube length
Calyx subcoriaceous	Calyx subpellucid
Calyx with broad throat	Calyx with narrow throat
Petal claws elongate	Petal claws short
Petal blades large	Petal blades small
Alae extended well beyond carina	Alae extended slightly past carina
Ovary large	Ovary small
Ovary densely sericeous	Ovary densely uncinata-pubescent
Ovary ecostate	Ovary costate
Androecium elongate	Androecium short
Androecium glabrous	Androecium uncinata-pubescent
Stamens diadelphous	Stamens subpolyadelphous or free
Legume long-stipitate	Legume sessile
Legume ecostate	Legume costate
Legume flattened	Legume turgid

Table 15 - continued

PRIMITIVE	ADVANCED
Legume large	Legume small
Valves twisting one-quarter to three-quarters of a turn	Valves twisting 1-3 turns
Many seeds per legume	Few seeds per legume
Seeds large	Seeds small
Seeds suborbicular, length nearly equals width	Seeds subreniform or ovoid, length exceeds width or width exceeds length
Seeds flattened	Seeds thickened
Seed coat smooth	Seed coat viscid
Seed germination epigeal	Seed germination hypogeal
x = 8	x = 12

subterranean xylopodium is horizontal, bearing a swollen proximal portion which has a knobby apex from which aerial stems arise, and a slender distal portion which extends great distances away from the plant and deeper into the soil. Species of sections Mexicana and Neurocarpum exhibit this trait whereas those of section Tanystyloba exhibit an intermediate condition in which there are frequently two to five vertical xylopodia, with the distal portion descending into the soil.

#### Vegetative Structures

Stipulate and stipellate plants are considered to be more primitive than estipulate and estipellate plants. All species of Clitoria have stipules and stipels, these structures usually persisting, but the stipules and stipels of members of section Brachycalyx are deciduous to caducous. The deciduous tendency of stipules and stipels is considered to be an advanced trait.

Subsessile leaves in which the petiole has become shorter than the rachis is considered to be an advanced characteristic derived from the long-petiolate leaves through the reduction of the petiole. This advanced condition is found in subgenus Clitoria and the sections Tanystyloba and Neurocarpum of subgenus Neurocarpum. The reduction of the petiole reaches a maximum in C. epetiolata in which the leaf stalk has become entirely lost, and the leaves become digitate.

There is a trend in the reduction of leaflet number. Some members of the genus Clitoria have more than three leaflets, exhibiting the primitive trait, whereas members of sections Tanystyloba and Neurocarpum often exhibit the advanced condition of 3- and 1-foliate leaves, or only 1-foliate leaves borne by the stem.

Members of section Tanystyloba have stalked unifoliate leaves in which the lateral leaflets and the rachis have been lost, whereas members of section Neurocarpum have sessile unifoliate leaves, the petiole also having been lost in addition to the rachis and lateral leaflets.

Leaflets exhibit a trend of reduction in size and the loss of the acumen. Large leaflets are characteristic of the primitive subgenus Bractearia whereas smaller leaflets are characteristic of the more advanced subgenera Clitoria and Neurocarpum. Species with a larger percentage of primitive characteristics often have a leaflet apex that is acuminate, whereas retuse to emarginate apices are associated most frequently with more advanced species. A leaflet with an apex that is short-acuminate or obtuse represents an intermediate trait.

Among the subshrubs and erect suffrutescent herbs, a trend toward shortening of the stem internodes and a more or less zigzag arrangement occurs. Zigzag stems bearing short internodes are regarded as an advanced condition.

#### The Inflorescence Structures

Woody inflorescences characteristic of the subgenus Bractearia are more primitive than the sublignose to herbaceous inflorescences found in subgenera Clitoria and Neurocarpum. There is disagreement as to which inflorescence type is to be regarded as the primitive type (Radford et al., 1974, p. 575). Panicles are sometimes regarded as the more primitive type of inflorescence and this may be the case in Clitoria as the panicle or subpanicle is commonly associated with woody inflorescences and with the more primitive sections Bractearia and Flexuosa. Nodose inflorescences and racemes appear to represent intermediate traits. Nodose inflorescences are lignose and appear to



be derived from the subpanicle by a reduction of the primary lateral branches which bear the pedicels to a knobby structure at the nodes of the central axis. Racemes are either woody or herbaceous and appear to be derived by the loss of the knobby structure such that the pedicels are borne directly on the central axis. Nodose and woody racemes are characteristically found in sections Brachycalyx and Cauliflorae. The herbaceous panicle and subpanicle is found only in section Mexicana, the more primitive section within the more advanced subgenus Neurocarpum. Herbaceous racemes and pedunculate inflorescences are characteristic of subgenera Clitoria and Neurocarpum. The pedunculate inflorescence typically bears a pair of flowers at its apex, is more or less herbaceous, and is considered to be the advanced condition. Within the more advanced subgenus Neurocarpum, section Tanystyloba exhibits predominantly racemose inflorescences whereas section Neurocarpum exhibits predominantly a pedunculate inflorescence.

Terminal and axillary inflorescences are considered to be primitive. A derived condition is cauliflory, which is characteristic of section Cauliflorae, and is regarded as an advanced trait.

The axis of the inflorescence is typically arcuate to nearly straight. The derivation of a weakly to strongly zigzag inflorescence is considered to be an advanced trait, and is characteristic of section Flexuosa.

The length of the inflorescence is difficult to interpret. There is a trend within the woody subgenus toward a decrease in the length of the peduncle that is considered to represent an advanced condition. A similar trend can be observed to occur in the more herbaceous

subgenera. The highly elongated inflorescences characteristic of only two species (C. leptostachya and C. pendens) are considered to be advance characteristic in which evolution is preceding in the elaboration of the inflorescence instead of a reduction of the inflorescence to that of being sessile.

### The Flowers

Those species which produce multi-flowered inflorescences exhibit the primitive trait and are more commonly found in the subgenus Bractearia. Species producing 2 (4-6) flowers per inflorescence exhibit the advanced trait and are characteristic of the subgenera Clitoria and Neurocarpum.

Cleistogamous flowers are a derived trait characteristic of only sections Mexicana and Neurocarpum of the subgenus Neurocarpum.

Actinomorphic flowers are commonly regarded as a primitive condition, but within the genus Clitoria, the actinomorphic flowers of C. ternatea represent a secondarily derived condition resulting from a dominant gene mutation (Senn and Krishnan, 1961). In addition, the stamens become almost to entirely free. The actinomorphic flowers and subpolyadelphous to free stamens as represented by C. ternatea are considered to be advanced conditions.

Flowers exhibit a trend in reduction from the large flower size to a small flower size. Those structures which correlate with the size of the flower, such as the carina blade and claw, vexillum claw, and the staminal tube, follow the same trend. The alae also exhibits a trend toward the reduction of the blade and claw, as well as the length of its extension beyond the carina, but the reduction appears to be independent of the flower size. The occasional very large

flowers that occur within section Flexuosa appear to be a reversal of the trend toward reduction, and represent a more advanced condition.

A calyx with many prominent nerves raised above the surface is considered to be more primitive than a calyx in which only five or ten nerves are prominently raised. The primitive trait is characteristic of the subgenus Bractearia and the 5- or 10-nerved calyx characteristic of subgenera Clitoria and Neurocarpum.

Calyx lobes are commonly conspicuous and shorter than the length of the calyx tube to occasionally nearly equalling the tube length. The large calyx lobes shorter than the tube is considered the primitive condition from which two distinct traits were derived. The reduction of the calyx tube and lobes occurs such that the calyx tube becomes less infundibular and approaches a cup-shaped calyx, the lobes minute and nearly lacking. This derived condition is characteristic only of section Brachycalyx. In section Tanystyloba, the calyx tube has become reduced such that the lobes have become stretched out and typically are longer than the tube, a condition considered to be advanced.

The derivation of the subpellucid calyx and bracteoles is considered to be an advanced trait in which the tissue between the veins becomes translucent. Subpellucid calices and bracteoles are characteristic only of members of subgenus Clitoria.

Bracteoles which are broadly oblong to broadly ovate to suborbicular and typically subequal to larger than the calyx (thus hiding it), exhibit the primitive trait. Hutchinson (1969) noted that this primitive characteristic found in the Caesalpinioideae is lacking in the Papilionaceous legumes. Primitive bracteoles are

common in sections Bractearia and Flexuosa and occasionally observed in a couple of species of subgenus Clitoria in which primitive bracteoles sometimes occur on the same plant with the advanced trait. The advanced condition is considered to be a narrow bracteole which is much shorter than the calyx tube, as represented by most species. Those species which have elongate bracteoles subequal to longer than the calyx tube, but which are narrow, are considered to represent an intermediate trait.

A few species exhibit the trait in which the bracteoles are inserted well below the calyx, the result of the elongation of the pedicel between the bracteoles and the calyx base, a condition interpreted as advanced. Bracteoles also exhibit a trend toward fewer nerves more prominently raised from the multinerved (=striated) primitive bracteoles.

Foliateous bracts similar to the primitive foliateous bracteoles in structure, although somewhat smaller, occur only in two species of section Flexuosa and one species of section Bractearia. Foliateous bracts are considered to represent the primitive trait.

#### The Fruits and Gynoecium

The ecostate legume with flattened valve surfaces is considered to represent the primitive condition, whereas the turgid legume with a prominently raised, lateral nerve near the midline on the outer surface of each valve is considered to exhibit the advanced trait. Lomentaceous legumes are regarded as an intermediate evolutionary trait between the primitive fruit type and the costate fruits. The lomentaceous trait appears to occur in two stages. First, there is an elevation around the seed and a depression formed in the surface of

the valve between the seeds, although the valve surface above the seed is still basically flattened. The second stage exhibits a change in the curvature of the surface of the valve from flattened to convex as the valves become turgid around the seed. Costate fruits will appear somewhat flattened during juvenile stages of development, then become turgid around the seed and extending to the zone between the seeds to produce a turgid, subtetragonous legume. Subgenera Bractearia and Clitoria exhibit the primitive legume trait with only the members of section Brachycalyx and rarely a more advanced species from another section possessing the first stage of the intermediate type. Members of sections Mexicana and Tanystyloba of the subgenus members of section Neurocarpum possess the advanced trait.

Stipitate fruits characteristic of subgenera Bractearia and Neurocarpum are considered primitive to the sessile fruits of subgenus Clitoria. The advanced trait is derived through the reduction of the stipe.

The legume exhibits a trend toward reduction in size, a less pronounced thickening of the sutures, and an increase in the number of spiral turns that the valves undergo after dehiscence. The base of the legume exhibits a trend from an exerted position above the calyx to one of being enclosed within the legume through the reduction of the length of the stipe.

The gynoecium exhibits a correlating trend of reduction in the size of the ovary and the length of the gynophore. Large ovaries are characteristic of subgenus Bractearia with smaller ovaries present in subgenera Clitoria and Neurocarpum. Sessile ovaries are characteristic of subgenus Clitoria whereas longer gynophores are

found in subgenera Bractearia and Neurocarpum. Ovaries of members of section Neurocarpum which exhibit the advanced trait of costate fruits also typically possess a medial nerve on the lateral face of the ovary.

The derivation of the viscid seed coat as a mechanism for increased seed dispersal is an advanced trait over the smooth seed coat. The primitive trait is found in all species of subgenera Bractearia and Clitoria, whereas the viscid seeds are typical of all members of subgenus Neurocarpum.

Large compressed seeds with nearly orbicular faces are considered to have primitive traits, and occur in the subgenus Bractearia. Seeds which are small, thickened, and somewhat oblong to ovoid (length typically greater than width) or subreniform (length typically less than width), are considered to exhibit advanced traits, and occur in the subgenera Clitoria and Neurocarpum.

There is a trend toward a reduction in the number of seeds produced per legume. One-seeded fruits rarely occur in legumes produced from cleistogamous flowers.

#### Pubescence

Elaboration of types of indumentation is regarded as a derived trait. Uncinate trichomes are rarely reported in legume genera, the exceptions being Clitoria and allied genera. Within the genus Clitoria uncinate trichomes are present on a number of structures, but on some become very dense. Densely uncinate-pubescent structures are interpreted as an elaboration of the indumentation type because this condition occurs in a small number of closely related species

considered to have more advanced traits than the other members of the taxon.

The ovary is typically covered with dense, appressed, macro-trichomes. There is a trend toward the loss of these trichomes and toward the elaboration of an indumentum of the ovary which bears dense, microscopic, uncinata trichomes which collectively are nearly visible to the naked eye. Uncinate-pubescent ovaries as described are common in the sections Tanystyloba and Neurocarpum.

The calyx tube typically lacks the uncinata trichomes or it bears a few scattered trichomes over its surface. There is a trend toward the production of a calyx with a densely uncinata-pubescence in members of the section Tanystyloba and a few more advanced members of section Cauliflorae.

The androecium is typically glabrous. In some members of section Brachycalyx the apex of the staminal tube, and occasionally including the filaments, develop a moderate to dense, uncinata-pubescence.

There is also a tendency to develop the uncinata pubescence on the upper surface of those leaves whose leaflets become elongated and narrowed, with the density of the trichomes seemingly increasing as the width decreases. This trend is observed in some members of subgenus Clitoria and sections Mexicana and Neurocarpum of subgenus Neurocarpum.

#### Nonmorphological Data

Epigeal seed germination, characteristic of the subgenera Bractearia and Clitoria, is considered to be a primitive trait, whereas hypogeal germination, characteristic of the subgenus Neurocarpum, is an advanced trait.

Turner and Fearing (1959) agree with Senn's phyletic scheme (1938) that  $x=8$  is one of the principal base numbers for the subfamily Papilionoideae and that a phyletic line of  $x=12$  might have arisen by aneuploid gain. Chromosome counts for species of Clitoria are rare, but the few counts are consistent in reporting a count of  $n=8$  in the subgenus Clitoria, thus representing the primitive trait, and a count of  $n=12$  in the subgenus Neurocarpum, representing an advanced trait. Chromosome counts are lacking in species of the subgenus Bractearia, the more primitive subgenus.

#### Phylogenetic Pathways in Clitoria

Phylogenetic lines within Clitoria based solely upon morphological data are tenuous, however interpretation of the available morphological data indicates the following possible relationships. Additional data from other areas could potentially provide considerable insight into probable phylogenetic pathways.

Subgenus Bractearia represents the closest match with the ancestral stock of Clitoria. Within subgenus Bractearia, section Bractearia has the greatest number of primitive characters, is nearly lacking in advanced traits, and is closely related to section Flexuosa which also possesses a large number of primitive traits. Members of section Bractearia are trees and large shrubs. Members of section Flexuosa developed a climbing habit and derived a flexuous inflorescence, a somewhat oblong seed, and a silky-pubescent calyx. Many of the floral and fruiting structures are similar to C. amazonum, the only species of section Bractearia with climbing tendencies,



suggesting that section Flexuosa possibly may have developed as a divergent evolutionary line from the one which gave rise to C. amazonum.

Sections Brachycalyx and Cauliflorae of the subgenus Bractearia are closely related and appear to have developed from an ancestral stock which diverged from the Bractearia line by the reduction of the foliaceous bracteoles and the lateral branches of the inflorescences, producing a nodose-racemose inflorescence. Section Brachycalyx has a number of primitive traits and is predominantly a group of arborescent and fruticose species. Members of section Brachycalyx developed an increased tolerance for drier environments after divergence from section Cauliflorae, a section of humid forest species. Members of section Brachycalyx have derived a distinct flowering and vegetative season, the flowers appearing each year before the leaves. They have moved toward estipulate leaves, a reduction of the calyx tube and lobes, and toward the early stages of the lomentaceous type of legume. The calyx lobes have undergone reduction at a faster rate than the calyx tube such that the lobes are minute to nearly lacking. Members of the section Cauliflorae failed to escape or at least showed no tendency toward broadening their niche beyond the moist tropical forests. After divergence from the Brachycalyx line, they developed a climbing habit and cauliflorous inflorescences. Some species have developed elaborate uncinat pubescence on the calyx and gynoecium, whereas others developed wax on the lower leaf surface, or highly elongated inflorescences arose.

The origin of subgenus Clitoria remains obscure. Its members exhibit characteristics similar to both subgenera Bractearia and

Neurocarpum, suggesting that possibly a divergent line from subgenus Bractearia provided the ancestral stock for both subgenera Clitoria and Neurocarpum. This line shows an advancement from the woody habit to a more herbaceous habit, accompanied by a reduction in the size of the leaflets, leaf-stalks, legumes, stipes, seeds, and portions of the gynoecium and androecium, as well as a trend toward the production of fewer flowers, fewer seeds, and a 10-nerved calyx. After divergence from the pro-Neurocarpum stock, members of the subgenus Clitoria developed the subpellucid calyx, subsessile fruits, and a trend toward the climbing habit, whereas members of the subgenus Neurocarpum developed lomentaceous fruits, viscid seeds, epigeal seed germination, and cleistogamous flowers. Another possibility is that subgenus Clitoria developed from a line diverging from the ancestral stock of Bractearia in which there developed a climbing tendency, a subpellucid calyx, and the reduction of many of the structures as a result of the decrease in the overall stature of the plant. Most of the similarities with subgenus Neurocarpum are a result of reduction of structures, and may represent convergent evolution.

Subgenus Neurocarpum appears to have its origins within the ancestral stock of sections Brachycalyx and Cauliflorae. Subgenus Neurocarpum has the greatest number of advanced traits within the genus, and has unique characteristics of viscid seeds, hypogean seed germination, lomentaceous to costate fruits, cleistogamy, and the subterranean xylopodium. The relationship of the three sections within the subgenus are obscure, but it appears that possibly each was derived from a common stock through separate evolutionary lines. Section Mexicana has the greater number of primitive traits, and a

number of similarities with some members of section Brachycalyx suggests that its origins may lie with the Brachycalyx line. Section Neurocarpum has the greater number of advanced characteristics, with many members having similarities with those of section Cauliflorae, suggesting its origins with this group. Section Tanystyloba has a more obscure origin, vegetatively similar in structures with members of section Neurocarpum, but having flowering and fruiting structures more closely agreeing with those of section Mexicana, thus indicating its origins are probably more closely related with the Mexicana group.

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## BIOGRAPHICAL SKETCH


Paul R. Fantz was born March 12, 1941, at St. Louis, Missouri. He graduated from Lindbergh High School, St. Louis, Missouri, in June, 1959. He attended Southern Illinois University, Carbondale, Illinois, where he received the degree of Bachelor of Science in Education. From 1964 to 1972, he taught a variety of science courses in a secondary school of the Mehlville School District, St. Louis, Missouri. He was chairman of the Science Department from 1967 to 1972. He participated in the organization of district coverage of Health-Major Medical Insurance, and served as the first chairman of the Mehlville District Insurance Committee, as co-chairman of the Mehlville District Medical Insurance Appeal Committee, and as 2nd Vice-President of the Mehlville Teacher Association from 1970 to 1972. During summers he attended Southern Illinois University where he received the degree of Master of Science in Education, his research topic being "A Comprehensive Osteology of Some of the Head Bones of the Common Shiner, Notropis cornutus, and the Striped Shiner, Notropis chrysocephalus." Under the enthusiasm and instruction of Dr. Robert H. Mohlenbrock, Mr. Fantz became highly interested in vascular plant systematics. He attended Washington University, St. Louis, Missouri, where he received the degree of Master of Arts in June, 1972. He conducted cytotaxonomic research on Triosteum (Caprifoliaceae) and floristic research on "The Fall Flora of Grey Summit Arboretum, Franklin County, Missouri." He

attended the University of Florida on a Graduate Council Fellowship, and during 1974-1976, served as an Interim Instructor in the Comprehensive Biological Science program at this institution, as well as a Graduate Instructor in the Department of Botany during the summers of 1974 and 1975. He received the degree of Doctor of Philosophy in August, 1977.

Mr. Fantz is a member of the American Association for the Advancement of Science, American Institute of Biological Sciences, American Society of Plant Taxonomists, Association of Southeastern Biologists, Botanical Society of America, and Sigma Xi. He has presented three papers at the ASB meetings on his preliminary research with Clitoria.

Mr. Fantz is married to the former Janet L. Nelsen of Chicago, Illinois. They have two children, Deborah Lynn and Susan Marie.

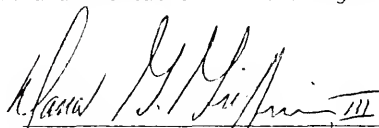
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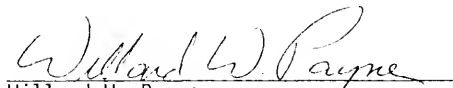
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Daniel B. Ward, Chairman  
Professor of Botany

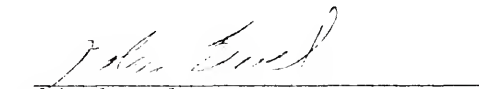
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Dana G. Griffin III  
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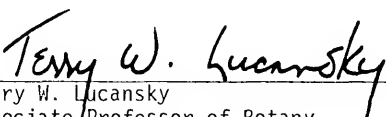
I certify that I have read this study and that in my opinion it conforms to acceptable standards of scholarly presentation and is fully adequate, in scope and quality, as a dissertation for the degree of Doctor of Philosophy.

  
Willard W. Payne  
Professor of Botany

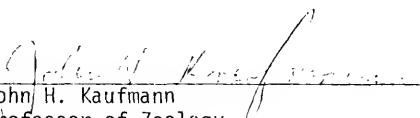
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John J. Ewel  
Associate Professor of Botany

I certify that I have read this study and that in my opinion it conforms to acceptable standards of scholarly presentation and is fully adequate, in scope and quality, as a dissertation for the degree of Doctor of Philosophy.

  
Terry W. Lucansky  
Associate Professor of Botany

I certify that I have read this study and that in my opinion it conforms to acceptable standards of scholarly presentation and is fully adequate, in scope and quality, as a dissertation for the degree of Doctor of Philosophy.

  
John H. Kaufmann  
Professor of Zoology

This dissertation was submitted to the Graduate Faculty of the Department of Botany in the College of Arts and Sciences and to the Graduate Council, and was accepted as partial fulfillment of the requirements for the degree of Doctor of Philosophy.

August 1977

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Dean, Graduate School



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